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Department
of Transportation

National Highway
Traffic Safety
Administration

DOT HS **808 216**

August 1993

Final Report

Reducing Heavy Truck Aggressiveness Moving Heavy Truck Into a 1993 Honda Civic 3-Door Hatchback at 80.1 KPH

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Technical Report Documentation Page

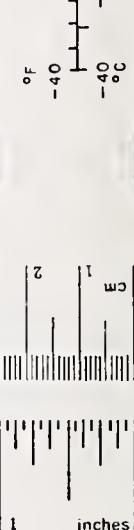
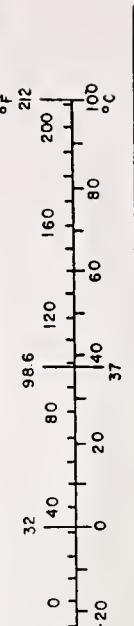
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16. Abstract This test report documents a crash test that was conducted for research and development in support of reducing heavy truck aggressiveness. This test was conducted with a 1993 Honda Civic 3-door hatchback, VIN 2HGEH2359PH526698, at Transportation Research Center Inc. on August 10, 1993. The test vehicle was impacted on the left front of the vehicle by the heavy truck. The struck vehicle contained ten (10) accelerometers and one (1) instrumented Hybrid III driver dummy.		14. Sponsoring agency Code DOT/NHTSA/VRTC
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find	Symbol
<u>LENGTH</u>								
in ft yd mi	inches feet yards miles	*2.5 30 0.9 1.6	centimeters centimeters meters kilometers	cm m km	mm cm m km	millimeters centimeters meters kilometers	inches inches feet yards miles	in in ft yd mi
<u>AREA</u>								
in ² ft ² yd ² mi ²	square inches square feet square yards square miles	6.5 0.09 0.8 2.6	square centimeters square meters square meters square kilometers	cm ² m ² m ² ha	cm ² m ² m ² ha	square centimeters square meters square kilometers hectares (10,000 m ²)	square inches square yards square miles acres	in ² yd ² mi ²
oz lb	ounces pounds short tons (2000 lb)	28 0.45 0.9	grams kilograms tonnes	g kg t	g kg t	grams kilograms tonnes (1000 kg)	ounces pounds short tons	oz lb
<u>VOLUME</u>								
tsp Tbsp fl oz c pt qt gal ft ³ yd ³	teaspoons tablespoons fluid ounces cups pints quarts gallons cubic feet cubic yards	5 15 30 0.24 0.47 0.95 3.8 0.03 0.76	milliliters milliliters milliliters liters liters liters cubic meters cubic meters	ml ml ml l l l m ³ m ³	ml ml ml l l l cubic meters cubic meters	fluid ounces pints quarts gallons cubic feet cubic yards	fl oz pt qt gal ft ³ yd ³	
<u>TEMPERATURE (exact)</u>								
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
<u>Approximate Conversions from Metric Measures</u>								
<u>LENGTH</u>								
mm cm m km	millimeters centimeters meters kilometers	20 19 18 17	inches inches feet yards miles	in in ft yd mi	inches inches feet yards miles	0.04 0.4 3.3 1.1 0.6	inches inches feet yards miles	in in ft yd mi
<u>AREA</u>								
cm ² m ² km ²	square centimeters square meters square kilometers	16 15 14 13 12 11 10 9 8 7	square centimeters square meters square meters square kilometers	cm ² m ² m ² ha	square centimeters square meters square kilometers hectares (10,000 m ²)	0.16 1.2 0.4 2.5	square inches square yards square miles acres	in ² yd ² mi ²
g kg t	grams kilograms tonnes	5 4 3 2 1	grams kilograms tonnes	g kg t	grams kilograms tonnes (1000 kg)	0.035 2.2 1.1	ounces pounds short tons	oz lb
<u>VOLUME</u>								
m ³	cubic meters	2 1 0.3 0.1 0.03 0.001	cubic meters	m ³	cubic meters	0.03 2.1 1.06 0.26 35 1.3	fluid ounces pints quarts gallons cubic feet cubic yards	fl oz pt qt gal ft ³ yd ³
°C	Celsius temperature	32	°C	°C	°C	98.6	Fahrenheit temperature	°F
<u>TEMPERATURE (exact)</u>								
°F	Fahrenheit temperature	32	°C	°C	°C	32	°F	°F

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NAS Msc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10;286.



°F °C °F °C °F °C °F °C °F

212 100 32 0 212 100 32 0 212

100 50 60 15 100 50 60 15 100

80 40 20 10 80 40 20 10 80

60 30 10 5 60 30 10 5 60

40 20 5 3 40 20 5 3 40

20 10 3 2 20 10 3 2 20

10 5 2 1 10 5 2 1 10

5 2.5 1 0.5 5 2.5 1 0.5 5

0 0 0 0 0 0 0 0 0

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SECTION 1.0

PURPOSE AND TEST SUMMARY

This test was conducted as research in support of reducing heavy truck aggressiveness. This test was conducted on August 10, 1993.

The stationary vehicle, a 1993 Honda Civic 3-door hatchback, was equipped with a 1.5-liter, 4-cylinder, transverse gasoline engine and a 5-speed manual transmission. The test weight of the vehicle was 1122 kg. The vehicle was instrumented with eight (8) longitudinal axis accelerometers, one (1) lateral axis accelerometer, one (1) vertical axis accelerometer and two (2) seat belt force load cells. One (1) Part 572E dummy was seated in the left front outboard seating position according to the dummy placement procedure specified in Appendix B and Optional Appendix C of Laboratory Procedure TP-208-08. The dummy was instrumented in the head, chest, and pelvis with longitudinal, lateral, and vertical accelerometers. The dummy was also instrumented with a 6-axis neck load cell, two (2) femur load cells, and a chest deflection potentiometer.

The stationary vehicle was impacted in the left front at 340 degrees by a moving heavy truck at 80.1 kph. The intended impact engagement was the left front of the car with the right front of the truck.

The moving heavy truck's test weight was 11,218 kg. The truck was equipped with a lowered flat rigid bumper. The truck was instrumented with two (2) longitudinal and lateral axis accelerometers and one (1) vertical axis accelerometer.

The dummy's head injury criterion, HIC, was 1437. The dummy's chest deceleration with 3 milliseconds minimum duration was 72.8 g. The dummy's maximum left femur force was 3521 N. The dummy's maximum right femur force was 7843 N.

The vehicle, dummy, and heavy truck data were multiplexed and recorded on a 14-channel analog tape deck. The analog data was digitally sampled at 8000 samples per second. The data was digitally filtered as per SAE J211 OCT88.

The test was filmed by one (1) real-time panning motion picture camera and five (5) high-speed motion picture cameras operating at approximately 500 frames per second.

Section 2.0 contains the vehicle, dummy, truck, and test data. Appendix A contains the pre- and post-test still photographs. Appendix B contains the final test data plots. Appendix C contains miscellaneous test information.

SECTION 2.0

VEHICLE, DUMMY, TRUCK AND TEST DATA

DATA ACQUISITION EXPLANATIONS

The engine top X-axis accelerometer, ENGXG1, lost data at 20 milliseconds because the accelerometer cable was cut by vehicle crush. This data loss affected the engine top X-axis velocity calculation, ENGXV1.

The left brake caliper X-axis accelerometer, BCLXG1, lost data at 22 milliseconds because the accelerometer cable was cut by vehicle crush. This data loss affected the left brake caliper X-axis velocity calculation, BCLXV1.

The right brake caliper X-axis accelerometer, BCRXG1, lost data at 103 milliseconds because the accelerometer cable was cut by vehicle crush. This data loss affected the right brake caliper X-axis velocity calculation, BCRXV1.

The instrument panel center X-axis accelerometer, DPCXG1, lost data at 29 milliseconds because the accelerometer cable was cut by vehicle crush. This data loss affected the instrument panel center X-axis velocity calculation, DPCXV1.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Heavy Truck into Stationary Vehicle

TEST DATE: 08/10/93 TEST TIME: 1450 AMBIENT TEMP. (°C): 19

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1993/Honda/Civic/3-door hatchback

VEHICLE TEST WEIGHT (KG): 1122

IMPACT ANGLE (DEG)*: 340

IMPACT VELOCITY (KPH)**: PRIMARY = 80.1 SECONDARY = 80.1

MAXIMUM STATIC CRUSH (MM): 933

DUMMY: Driver #048

TYPE: Part 572E

LOCATION: Left front

RESTRAINT: 3-point unibelt
and airbag

NUMBER OF DATA CHANNELS: 35

NUMBER OF CAMERAS: HIGH-SPEED 5 REAL-TIME 1

*With respect to tow track centerline.

**Speed trap measurement ($\pm .08$ kph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Honda of Canada, Mfg.

MAKE/MODEL: Honda/Civic

VIN: 2HGEH2359PH526698

BODY STYLE: 3-door hatchback

MODEL YEAR: 1993

COLOR: Red

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 1.5 liters

TRANSMISSION DATA: 5 SPEED, X MANUAL, AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: NA

ODOMETER READING: 167

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	No	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TLTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	Yes
OTHER	None		

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Honda of Canada, Mfg.

DATE OF MANUFACTURE: 03/93

VIN: 2HGEH2359PH526698

GVWR: 3055 LBS

GAWR: FRONT: 1610 LBS., REAR: 1500 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear, Invicta GL, P165/70R13

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 44 PSI
REAR: 44 PSI

SPARE TIRE (MFR., SIZE): Goodyear, Temporary, T105/80D13

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 1702 MILLIMETERS

WHEELBASE: 2570 MILLIMETERS

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located in the glove box.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P165/70R13 78S

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 PSI; REAR: 32 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: 850 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN MILLIMETERS):

DELIVERED ATTITUDE: LF 656; RF 662; LR 644; RR 645

PRE-TEST ATTITUDE: LF 640; RF 655; LR 590; RR 609

POST-TEST ATTITUDE: LF 762; RF 656; LR 566; RR 671

TABLE 2 TEST VEHICLE INFORMATION CONT'D.

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	287 KG	RIGHT REAR	178 KG
LEFT FRONT	293 KG	LEFT REAR	187 KG
TOTAL FRONT WEIGHT	580 KG	(61.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	365 KG	(38.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT	945 KG		
TARGET TEST WEIGHT	1122 KG ¹		

WEIGHT OF TEST VEHICLE:

RIGHT FRONT	303 KG	RIGHT REAR	243 KG
LEFT FRONT	321 KG	LEFT REAR	255 KG
TOTAL FRONT WEIGHT	624 KG	(56.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	498 KG	(43.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	1122 KG		

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: None

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 1140 MILLIMETERS REARWARD OF FRONT WHEEL CENTERLINE

¹The target test weight was established during Test 920825.

TABLE 3 TRUCK INFORMATION

WEIGHT DISTRIBUTION

FRONT: 3620 KG

REAR: 7598 KG

AXLE SPACING

FRONT: 3835 MM

REAR: 1308 MM

DISTANCE OF C.G. BEHIND FRONT AXLE: 3040 MM

BUMPER DESCRIPTION: Lowered flat rigid bumper.

TRUCK DAMAGE: There was no damage to the truck.

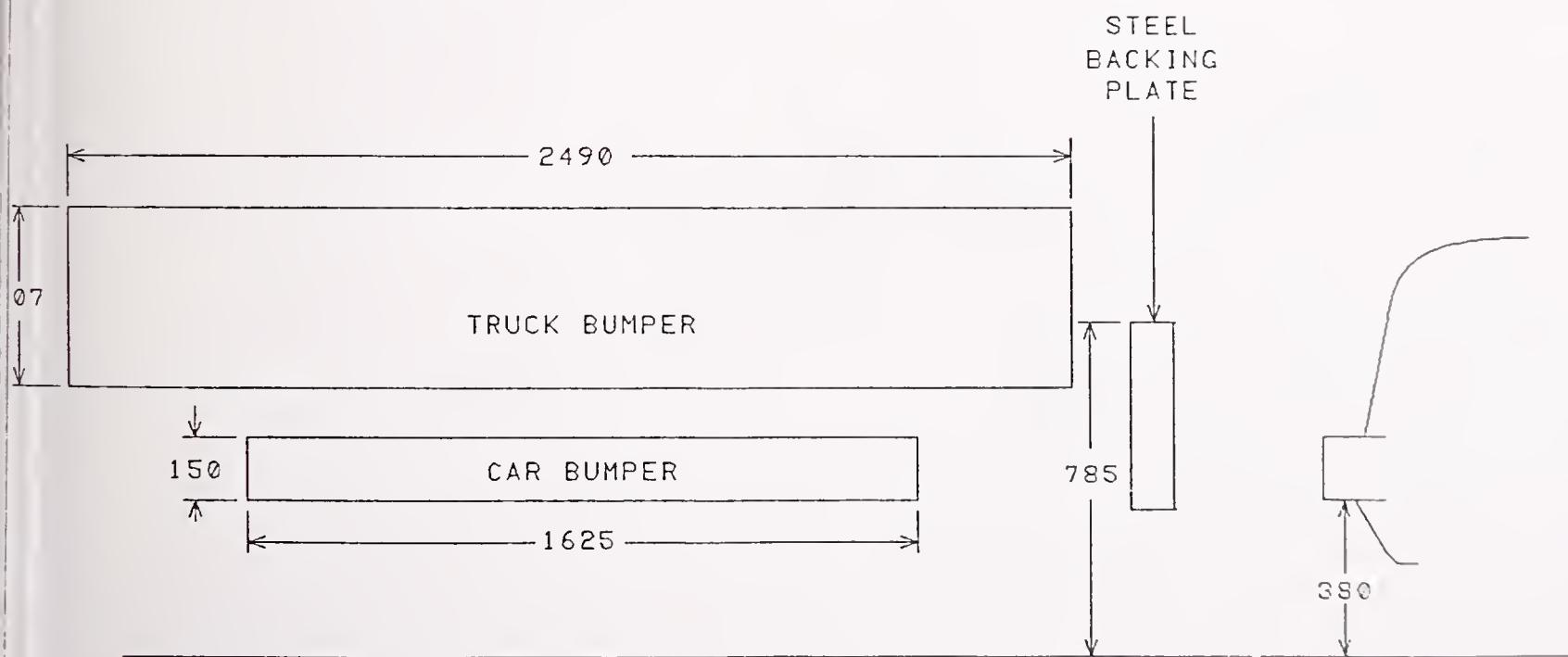


TABLE 4 POST-IMPACT DATA

TEST NUMBER: 930810

TEST DATE: 08/10/93

TEST TIME: 1450

TEST TYPE: Heavy Truck into Stationary Vehicle IMPACT ANGLE: 340

AMBIENT TEMPERATURE AT IMPACT AREA: 19° C

TEMPERATURE IN OCCUPANT COMPARTMENT: 19° C

IMPACT VELOCITY: PRIMARY = 80.1 KPH
SECONDARY = 80.1 KPH

(SPECIFIED RANGE = 79.7 TO 81.3 KPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 381 MM

EXITING VELOCITY TRAP = 51 MM

TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN MILLIMETERS):

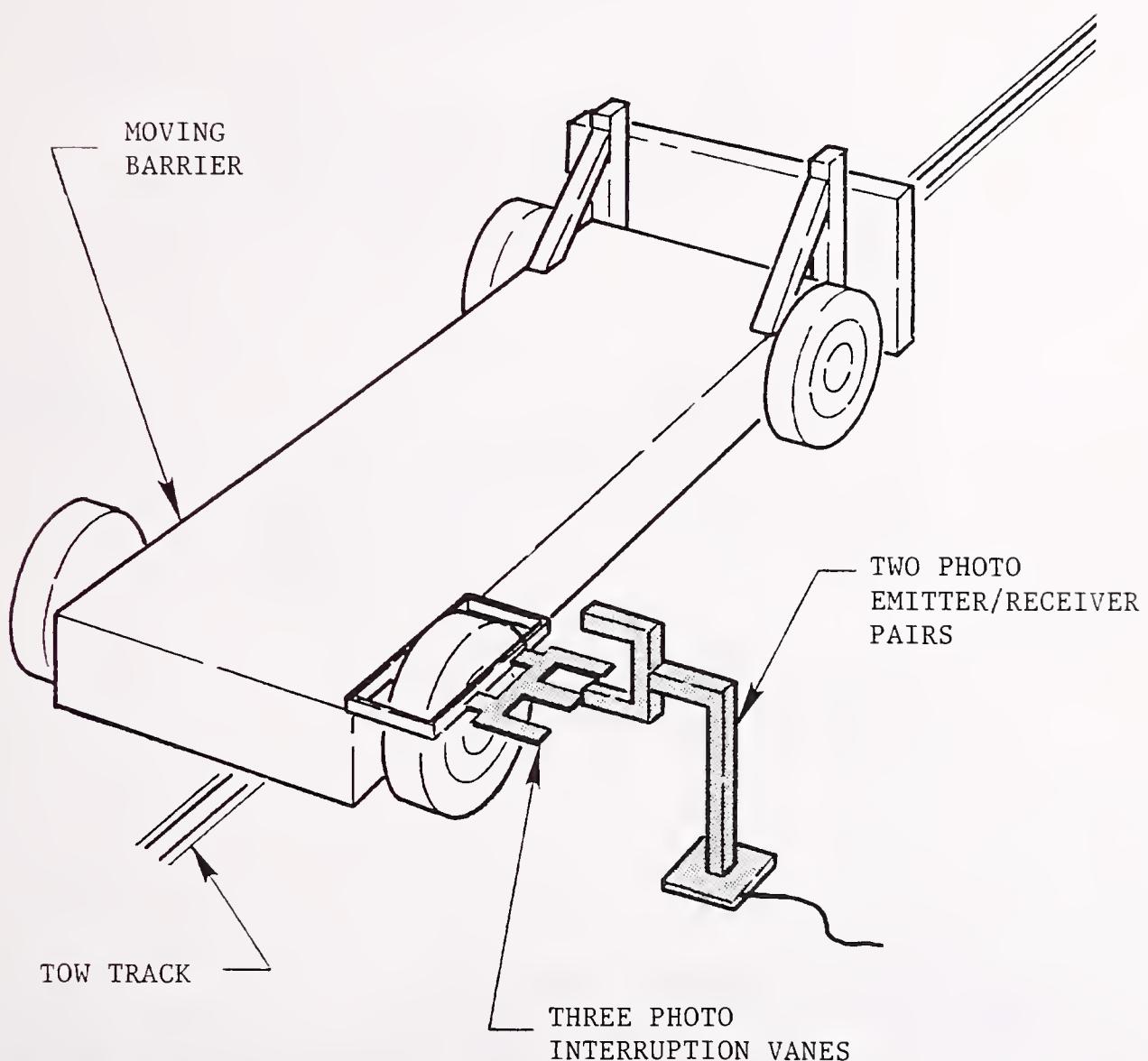
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 3905; C 4085; R 3910

POST-TEST: L 2972; C 3375; R 3751

TOTAL CRUSH: L 933; C 710; R 159

AVERAGE CRUSH: 601

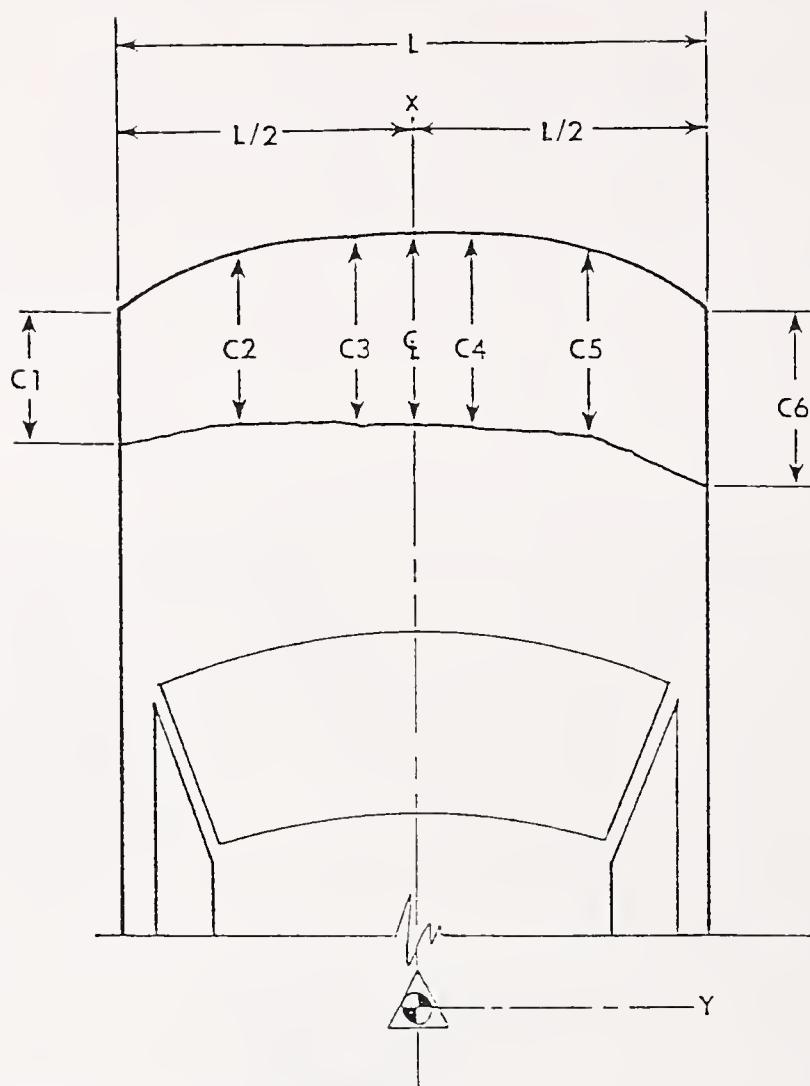
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver 51 millimeters before impact.

The vanes have 305-millimeter spacing.

FIGURE 2 VEHICLE CRUSH



NOTES: L is pre-test length of contact surface.

C1 through C6 are spaced equally apart.

CL is vehicle centerline.

All measurements are in millimeters.

Vehicle Honda Civic

PRE-TEST	POST-TEST	CRUSH
L <u>1396</u>		
C1 <u>3905</u>	C1 <u>2972</u>	C1 <u>933</u>
C2 <u>4020</u>	C2 <u>3154</u>	C2 <u>866</u>
C3 <u>4080</u>	C3 <u>3310</u>	C3 <u>770</u>
C4 <u>4081</u>	C4 <u>3436</u>	C4 <u>645</u>
C5 <u>4030</u>	C5 <u>3551</u>	C5 <u>479</u>
C6 <u>3910</u>	C6 <u>3751</u>	C6 <u>159</u>
CL <u>4085</u>	CL <u>3375</u>	CL <u>710</u>

FIGURE 3 PRE-TEST AND POST-TEST MEASUREMENT POINTS

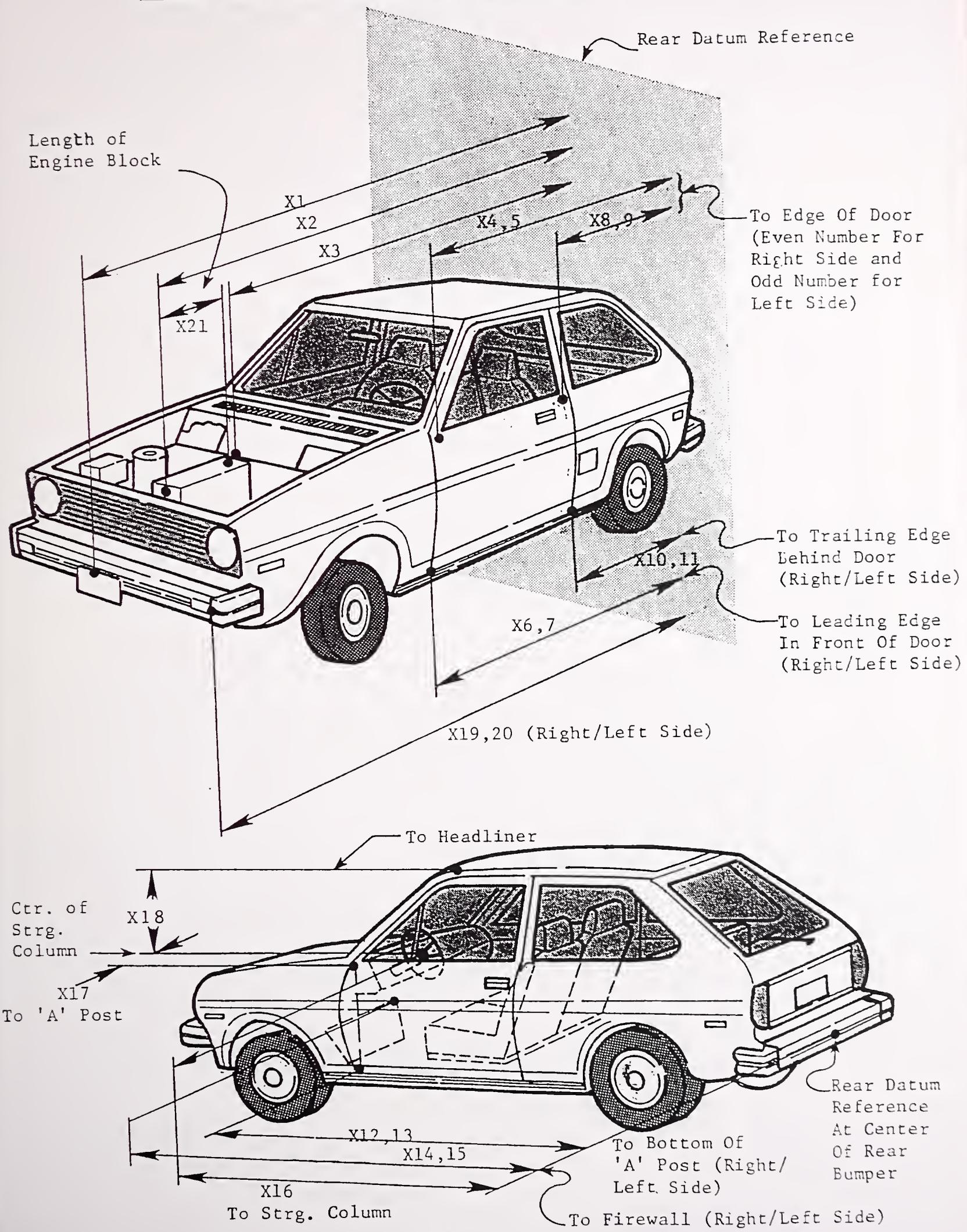


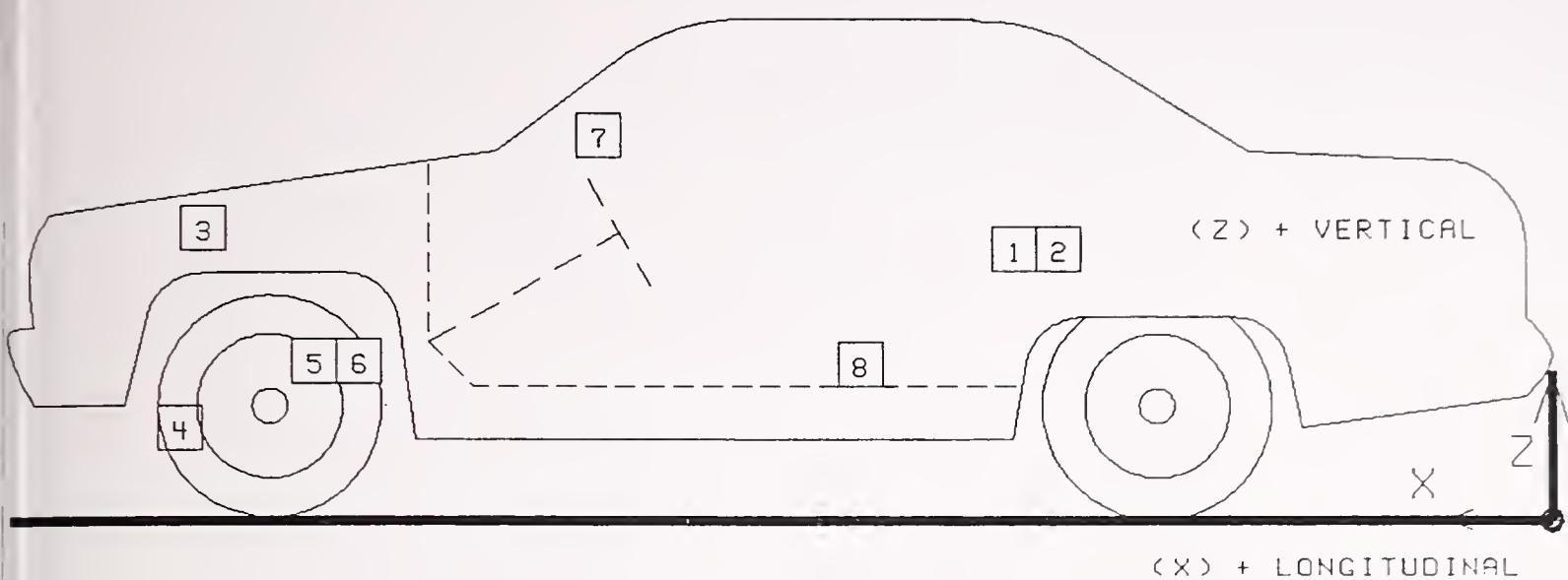
TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Honda/CivicTEST NUMBER: 930810

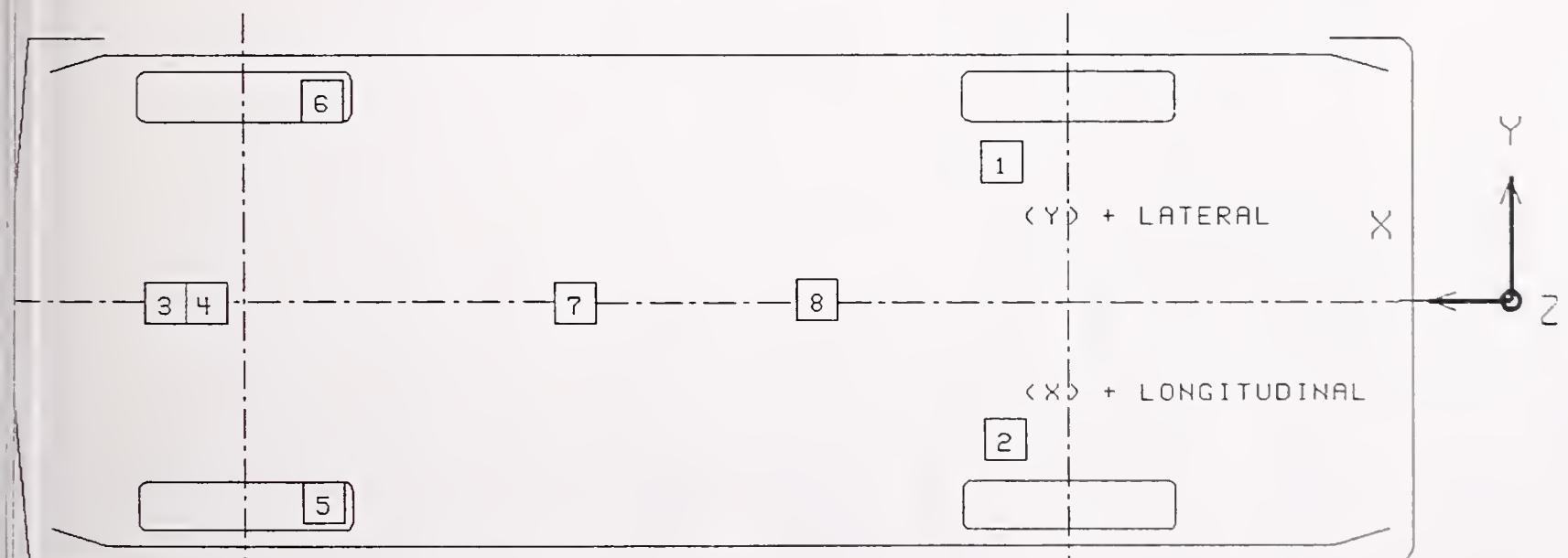
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	4085	3375	710
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	3593	3106	487
X3	REAR SURFACE OF VEHICLE TO FIREWALL	3045	2783	262
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	2743	2752	-9
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	2735	2375	360
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	2750	2739	11
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	2740	2383	357
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	1470	1484	-14
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	1460	1497	-37
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	1540	1524	16
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	1525	1495	30
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	2735	2735	0
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	2730	2316	414
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	2965	2871	94
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	2960	2671	289
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	2258	1974	284
X17	CENTER OF STEERING COLUMN TO "A" POST	260	321	-61
X18	CENTER OF STEERING COLUMN TO HEADLINER	430	565	-135
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	3910	3751	159
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	3905	2972	933
X21	LENGTH OF ENGINE BLOCK	410	410	0

All distance measurements are in millimeters.

FIGURE 4 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 6

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930810

No.	LOCATION	POSITIVE DIRECTION			NEGATIVE DIRECTION			
		X*	Y*	Z*	MAX G	MSEC	MAX G	MSEC
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	1302	520	330	1.8	158.6	33.1	45.5
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	1302	-543	342	3.1	134.4	42.0	27.5
3	ENGINE TOP LONGITUDINAL ¹	3510	25	749	---	---	---	---
4	ENGINE BOTTOM LONGITUDINAL	3457	240	184	22.5	28.0	232.8	18.8
5	RIGHT BRAKE CALIPER LONGITUDINAL ¹	3370	-652	261	---	---	---	---
6	LEFT BRAKE CALIPER LONGITUDINAL ¹	3370	652	254	---	---	---	---

TABLE 6

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 930810

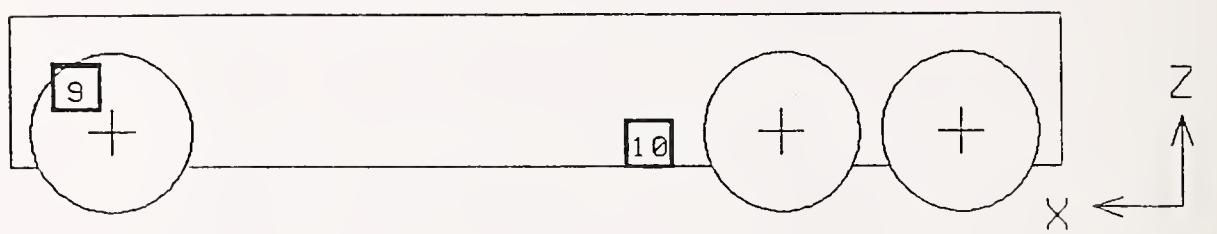
No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX G	MSEC	MAX G	MSEC
7	INSTRUMENT PANEL CENTER LONGITUDINAL ¹	2615	0	885	---	---	---	---
8	CENTER OF GRAVITY LONGITUDINAL LATERAL VERTICAL RESULTANT	1855	0	292	1.6 6.1 14.9 66.4	258.6 37.5 42.8 44.4	64.2 30.2 27.8 28.8	44.6 26.0 28.8

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

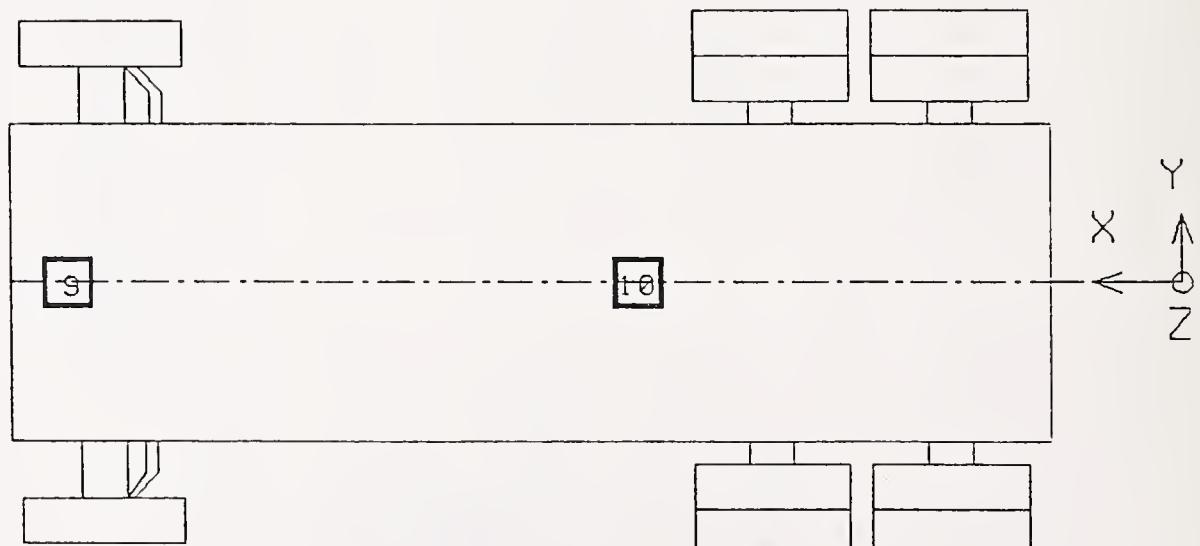
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

¹ See DATA ACQUISITION EXPLANATIONS

FIGURE 5 TRUCK ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 7

HEAVY TRUCK ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930810

No.	LOCATION	POSITIVE DIRECTION			NEGATIVE DIRECTION		
		X*	Y*	Z*	MAX G	MSEC	MAX G
9	FRONT FRAME CROSSMEMBER	6160	0	658			
	LONGITUDINAL				7.9	8.1	15.6
	LATERAL				15.2	47.9	18.1
	VERTICAL				21.7	34.1	12.2
	RESULTANT				21.9	34.1	28.4
10	CENTER OF GRAVITY	2527	0	1050			
	LONGITUDINAL				4.6	12.0	11.3
	LATERAL				3.8	70.9	2.6
							20.5
							37.8

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

REFERENCE: X: + FORWARD FROM TRAILING EDGE OF TRUCK
Y: + LEFT FROM TRUCK CENTERLINE
Z: + UP FROM GROUND LEVEL

TABLE 8

DUMMY DATA SUMMARY

TEST NUMBER 930810

DRIVER DUMMY
SN: 048
POSITIVE
DIRECTION
MAX MSECS
NEGATIVE
DIRECTION
MAX MSECS

HEAD ACCELERATION (g)	LONGITUDINAL	65.9	108.1	130.1	63.8
LATERAL	41.2	66.3	29.6	101.6	
VERTICAL	22.0	66.4	39.3	49.0	
RESULTANT	134.9	63.8			
HIC	1437	FROM	52.5	TO	75.9
NECK FORCE (N)	LONGITUDINAL	1450.1	63.1	641.5	101.8
LATERAL	554.9	58.1	90.4	227.3	
VERTICAL	3467.8	62.4	775.2	90.4	
RESULTANT	3704.6	62.4			
NECK MOMENT (N-M)	ABOUT X	31.9	69.9	38.4	103.5
ABOUT Y	70.9	99.0	119.5	64.0	
ABOUT Z	24.3	65.0	14.4	142.1	
RESULTANT	122.4	64.0			

TABLE 8

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 930810

DRIVER DUMMY	
SN:	048
POSITIVE DIRECTION	NEGATIVE DIRECTION
MAX	MAX
MSEC	MSEC
 CHEST ACCELERATION (g)	
LONGITUDINAL	20.4
LATERAL	7.7
VERTICAL	22.2
RESULTANT	86.3
3 MSEC	72.8
 CHEST DEFLECTION (mm)	
LONGITUDINAL	37.8
	59.0
	0.3
	11.9
 PELVIS ACCELERATION (g)	
LONGITUDINAL	17.9
LATERAL	38.9
VERTICAL	38.8
RESULTANT	85.4
 FEMUR LOAD (N)	
LEFT	1227.5
RIGHT	2784.2
	37.8
	57.4
	3521.4
	7843.2
	50.1
	35.9
 POSITIVE DIRECTION	
LONGITUDINAL:	FORWARD
LATERAL:	LEFTWARD
VERTICAL:	UPWARD
FORCE:	TENSION
 NEGATIVE DIRECTION	
LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD
VERTICAL:	DOWNWARD
FORCE:	COMPRESSION

TABLE 9 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #048	PASSENGER # NA
HEAD	Airbag	
CHEST	Airbag	
ABDOMEN	None	
LEFT KNEE	Instrument panel	
RIGHT KNEE	Instrument panel	

DOOR OPENING:

	LEFT	RIGHT
FRONT	Tools required	Opened easily
REAR	NA	NA

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	None	None
REAR	NA	NA

GLAZING DAMAGE:

The entire windshield cracked on impact.

The driver's side door glass broke on impact.

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

The dummy translated forward and to the left at impact. The airbag inflated and reacted against the dummy's head and upper torso. The dummy's hands and knees impacted the instrument panel and inner door panel. The dummy came to rest in the driver's seat leaning against the driver's side door restrained by the 3-point unibelt.

FIGURE 6 DUMMY AND SEAT POSITIONING DATA

PRE-IMPACT DATA:

MAKE/MODEL/BODY STYLE: Honda/Civic/3-door hatchback
 MODEL YEAR: 1993 COLOR: Red

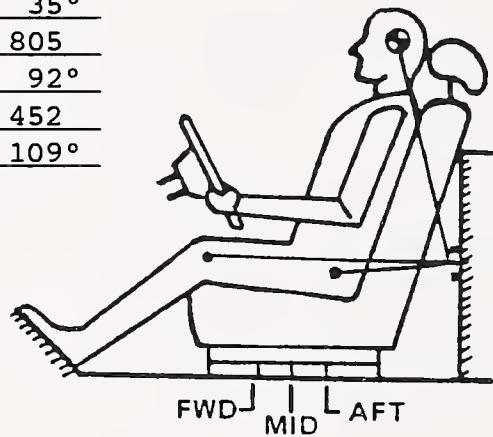
DATA FROM CERTIFICATION LABEL:

VEHICLE MANUFACTURER: Honda of Canada, Mfg.
 DATE OF MANUFACTURE: 03/93 VIN: 2HGEH2359PH526698
 GVWR: 3055 LBS.; GAWR: FRONT = 1610 LBS.; REAR = 1500 LBS.

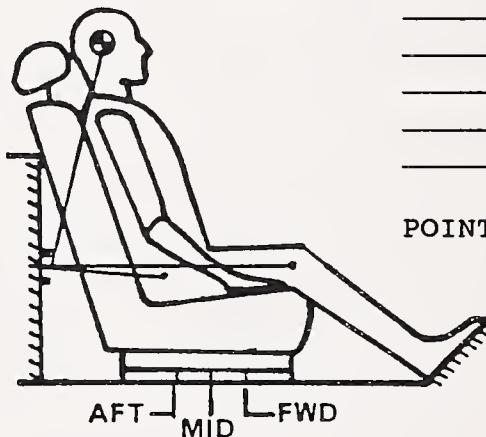
POST-IMPACT DATA:

DATE OF TEST: 08/10/93 TIME: 1450 TEMPERATURE: 19° C
 IMPACT VELOCITY: PRIMARY = 80.1 MPH SECONDARY = 80.1 MPH
 REQUIRED IMPACT VELOCITY RANGE: 79.7 TO 81.3 MPH
 SEAT TYPE: Bucket ADJUSTER TYPE: Manual
 FRONT SEAT BACK TYPE: Manually-adjustable
 TECHNICIANS: R. Benavides, P. Cummins, R. Cribley

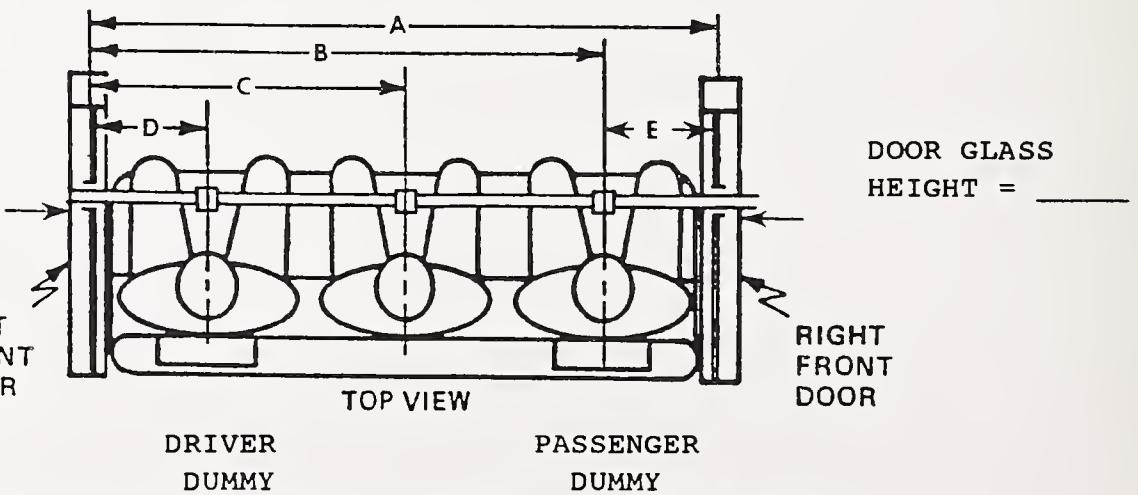
DRIVER DUMMY # 048 TYPE: HIII
 HEAD 575
 TARGET 35°
 KNEE 805
 JOINT 92°
 APPROX- 452
 IMATE 109°
 "H"
 POINT



PASSENGER DUMMY # NA TYPE: _____
 HEAD _____
 TARGET _____
 KNEE _____
 JOINT _____
 APPROX- _____
 IMATE _____
 "H" _____
 POINT



A = 1486
 B = NA
 C = NA
 D = 333
 E = NA
 DOOR GLASS
 HEIGHT = 238



ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.
 ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 7 DUMMY IN VEHICLE POSITIONING DATA

DRIVER	PASSENGER
048	NA
HH	293
HW	533
CD	457
CS	296
KDL	90
KDR	86
TA	22°
SA	21°
HSW	452

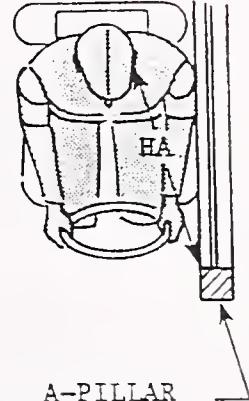
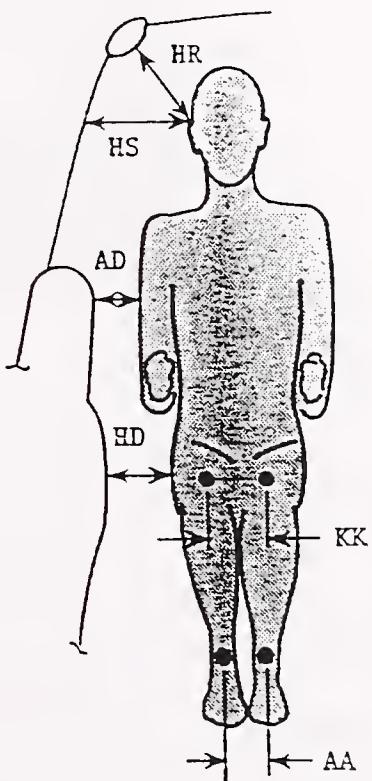
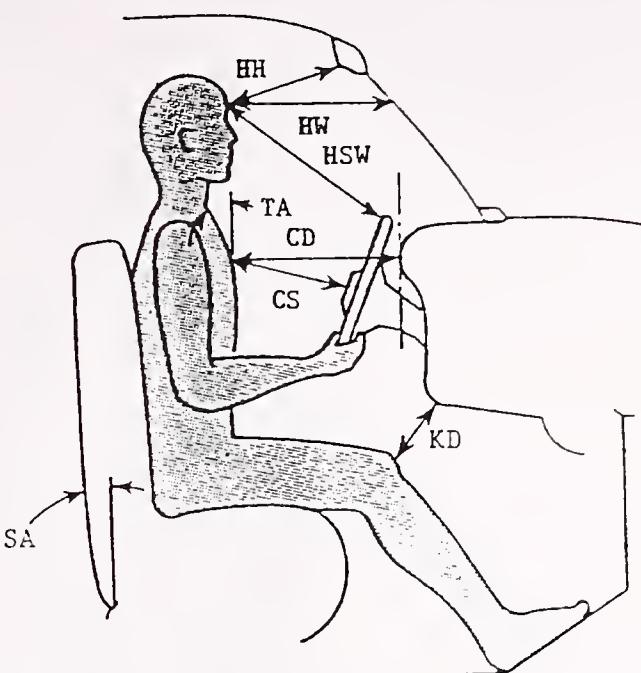
DRIVER	PASSENGER
048	NA
HR	162
HS	259
AD	91
HD	134
KK	210
AA	260
HA	530

KNEE OUTER CLEVIS TO
OUTER CLEVIS SPACING:

DRIVER = 330

PELVIS ANGLE:

DRIVER = 24°

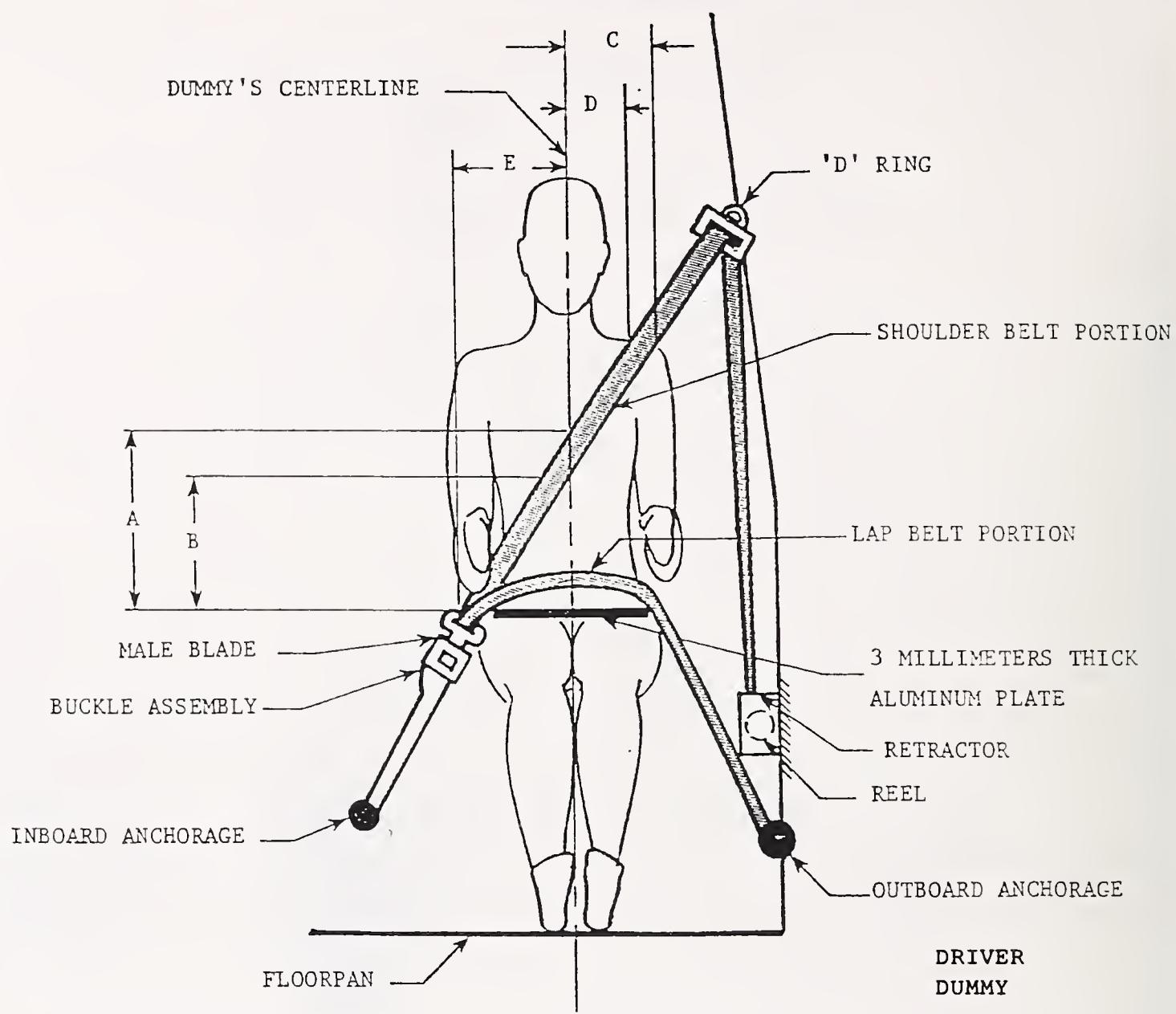


HH = HEAD TO WINDSHIELD HEADER
HW = HEAD TO WINDSHIELD
CD = CHEST TO DASH
CS = CHEST TO STEERING WHEEL
KD = KNEE TO DASH
TA = TORSO ANGLE
SA = SEAT BACK ANGLE
HSW = HEAD TO STEERING WHEEL

HR = HEAD C.G. TARGET TO SIDE ROOF HEADER
HS = HEAD C.G. TARGET TO SIDE WINDOW
AD = ARM TO DOOR
HD = HIP TO DOOR
ED = ELBOW TO DOOR
KK = KNEE TO KNEE
AA = ANKLE TO ANKLE
HA = HEAD C.G. TARGET TO A-PILLAR

TORSO AND SEAT BACK ANGLES ARE RELATIVE TO VERTICAL.
ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

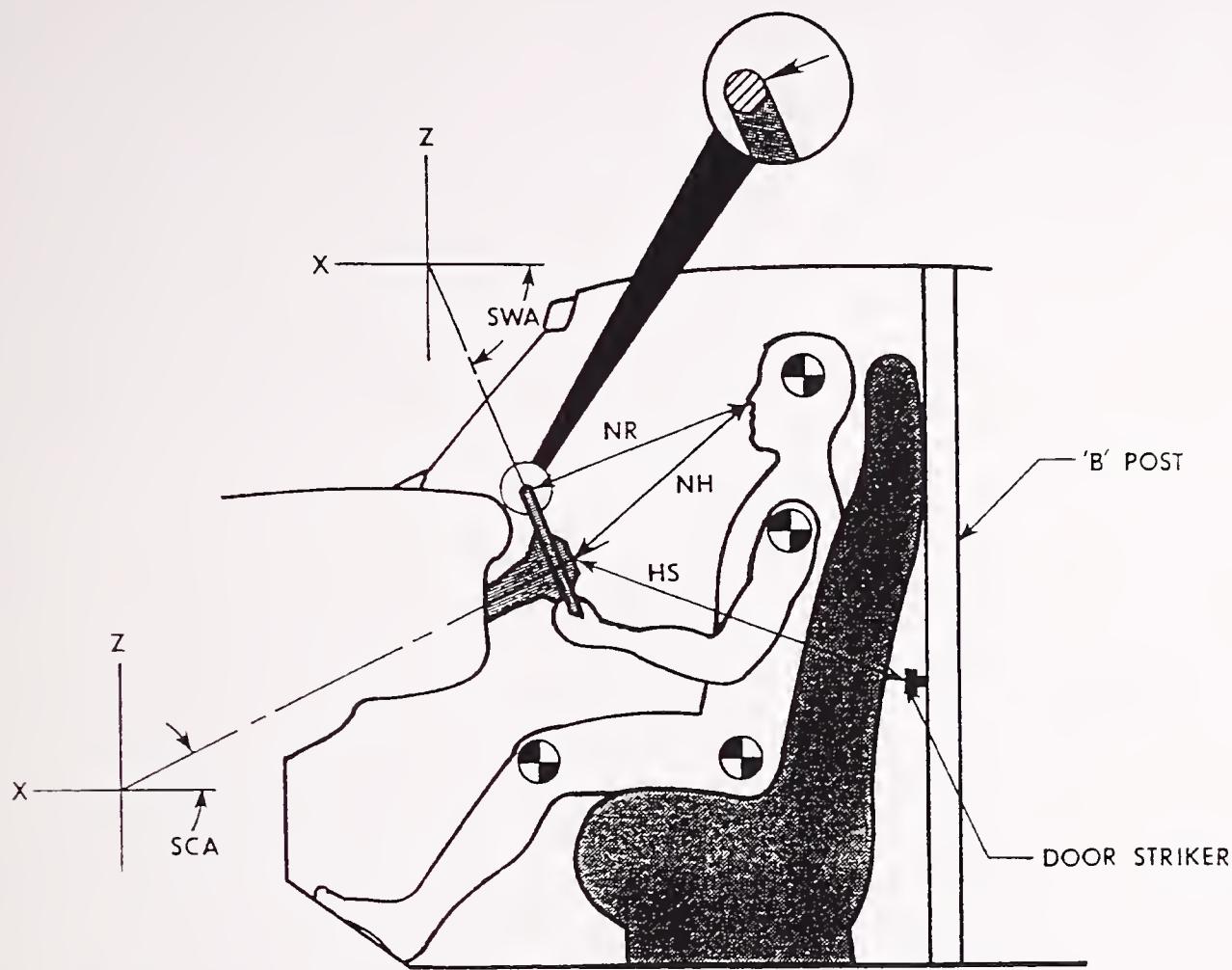
FIGURE 8 SEAT BELT POSITIONING DATA



A - TOP SURFACE OF ALUMINUM PLATE TO BELT UPPER EDGE	350
B - TOP SURFACE OF ALUMINUM PLATE TO BELT LOWER EDGE	275
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	114
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	50
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	300

ALL MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 9 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:
There were no steering column adjustments.

MEASUREMENTS

NR - DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	420
NH - DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	405
HS - DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	759
SCA - ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	24°
SWA - ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	66°

ALL DISTANCE MEASUREMENTS ARE IN MILLIMETERS.

FIGURE 10 CAMERA POSITIONS

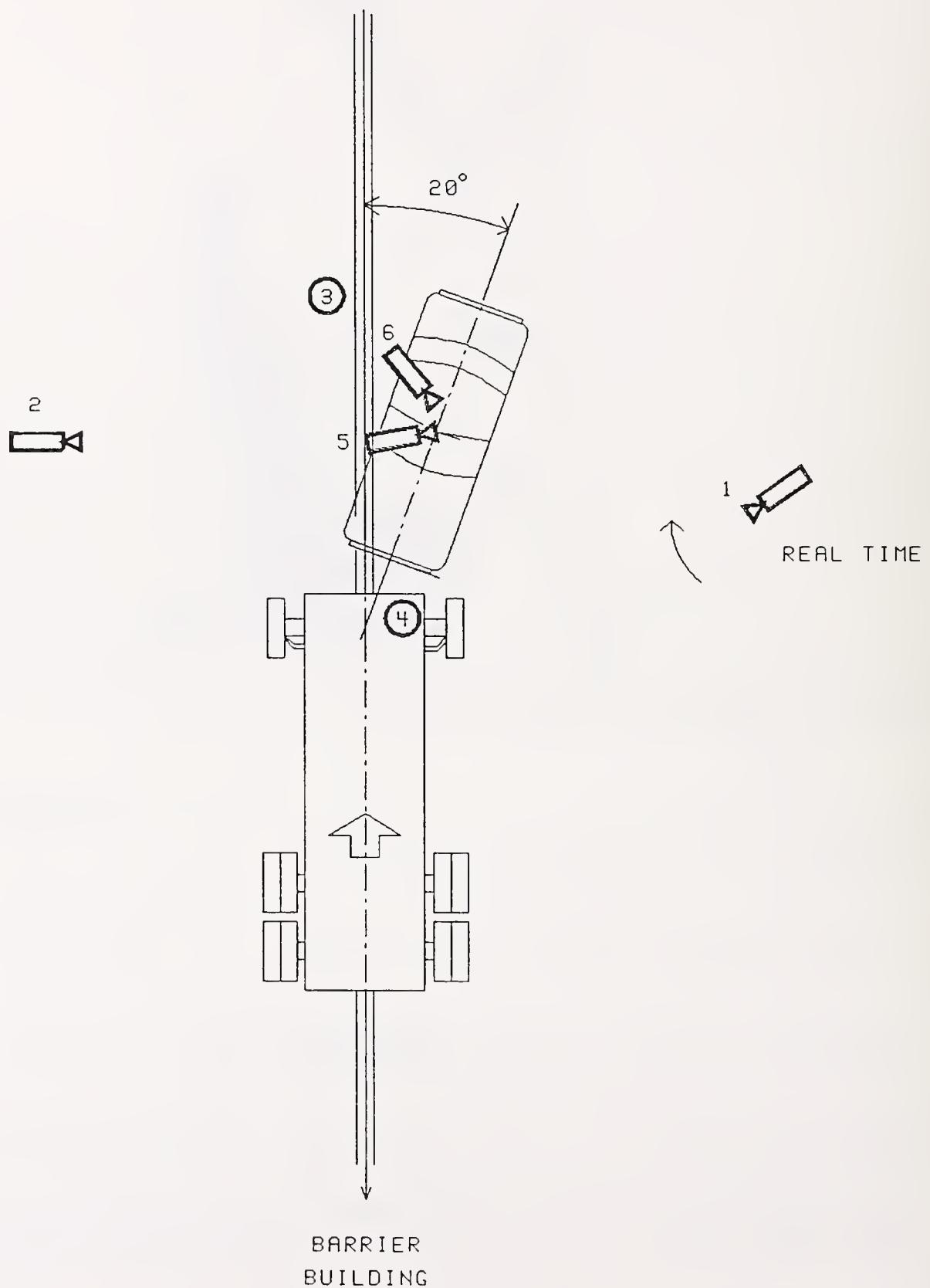


TABLE 10 MOTION PICTURE CAMERA INFORMATION

CAMERA NUMBER	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Right panning	Bolex	18	24	Real-time documentation
2	Left wide	Photosonic	13	498	Vehicle dynamics
3	Overhead wide	Photosonic	8.5	500	Vehicle dynamics
4	Onboard truck	Photosonic	8	505	Dummy kinematics
5	Onboard car-front	Photosonic	8	985	Dummy kinematics
6	Onboard car-rear	Photosonic	8	998	Dummy kinematics

APPENDIX A

PHOTOGRAPHS



Figure A-1. PRE-TEST VEHICLE FRONT VIEW

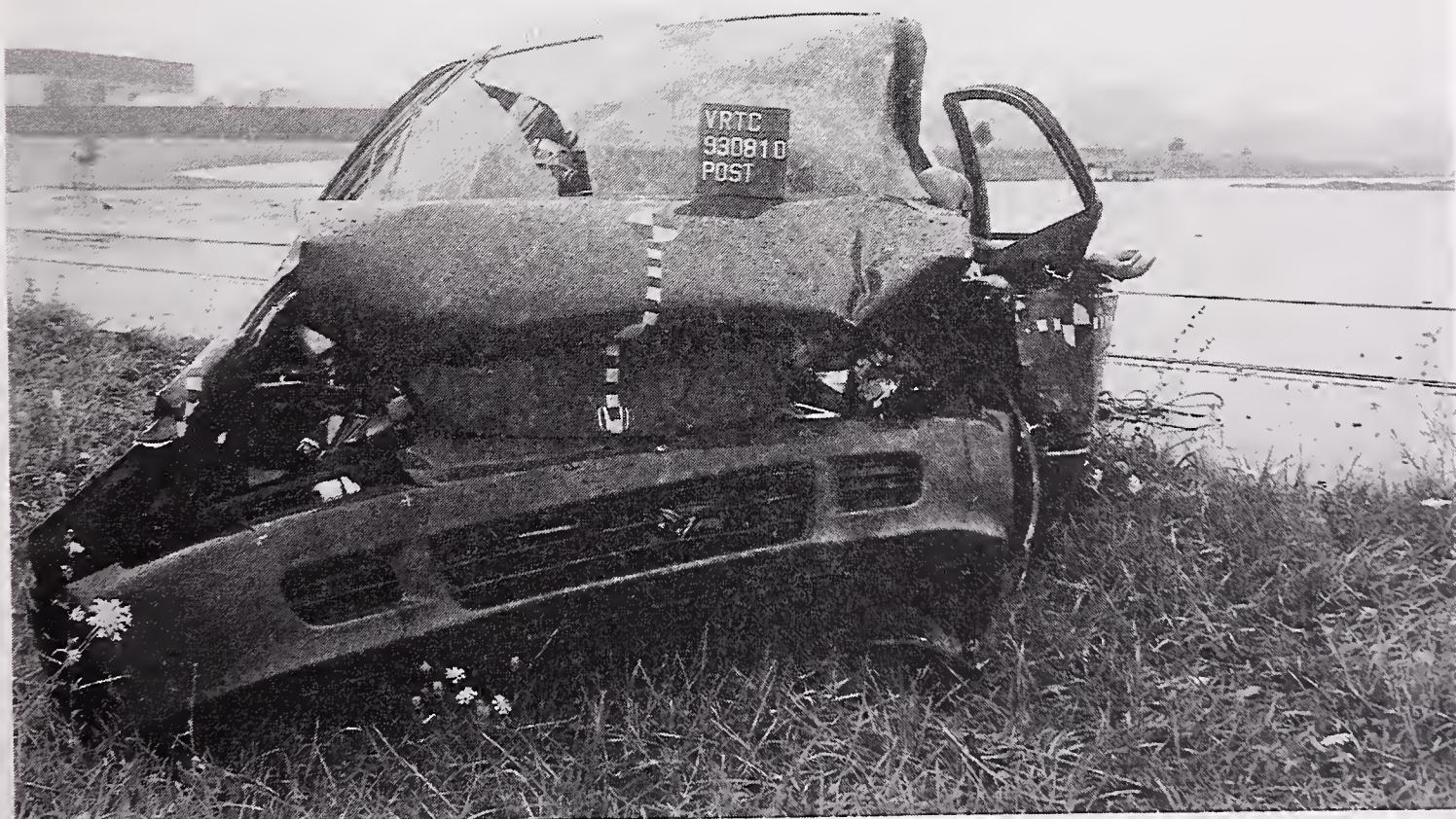


Figure A-2. POST-TEST VEHICLE FRONT VIEW



Figure A-3. PRE-TEST VEHICLE LEFT SIDE VIEW



Figure A-4. POST-TEST VEHICLE LEFT SIDE VIEW



Figure A-5. PRE-TEST VEHICLE REAR VIEW



Figure A-6. POST-TEST VEHICLE REAR VIEW



Figure A-7. PRE-TEST VEHICLE RIGHT SIDE VIEW



Figure A-8. POST-TEST VEHICLE RIGHT SIDE VIEW

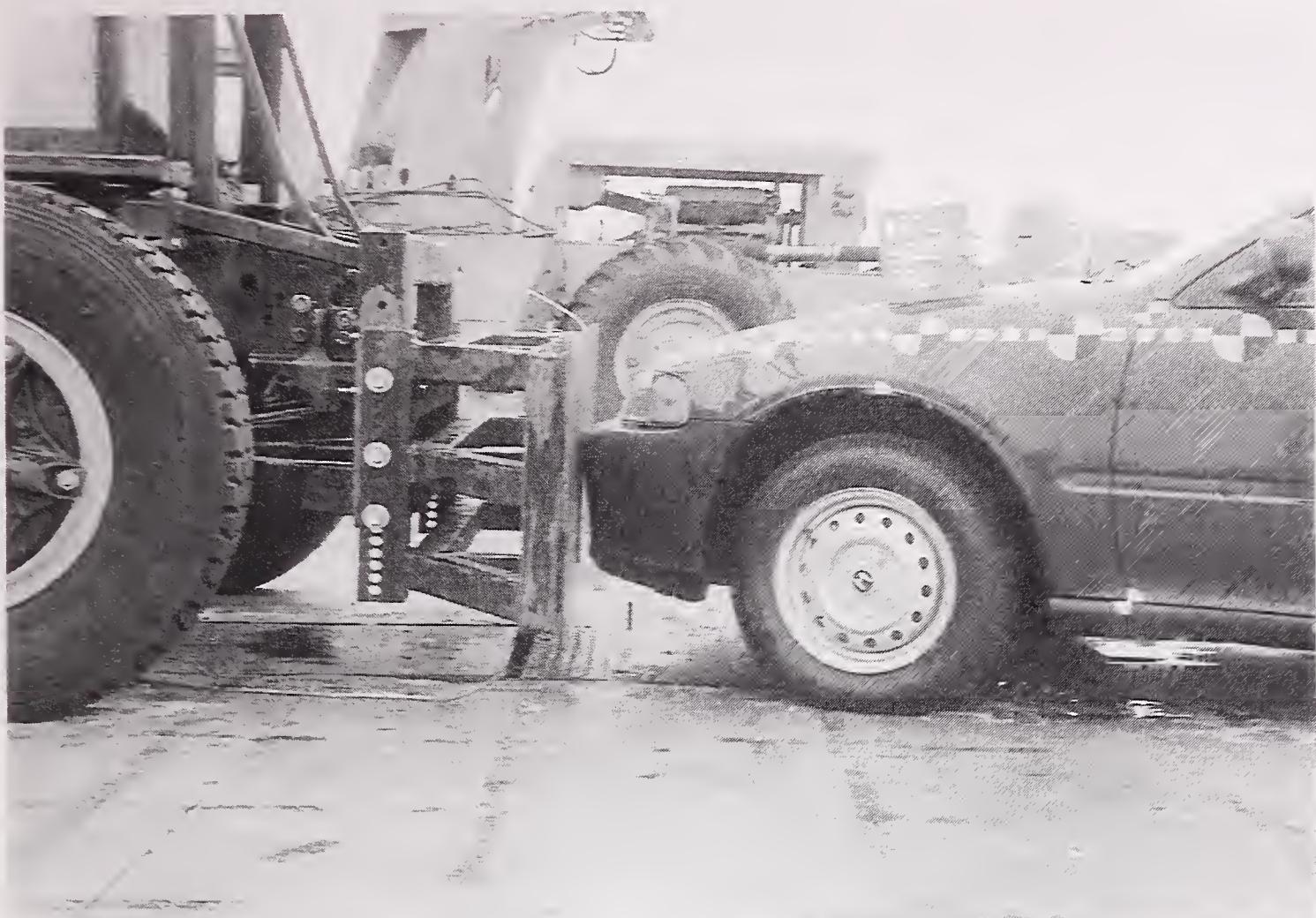


Figure A-9. PRE-TEST BUMPER ENGAGEMENT - VIEW 1



Figure A-10. PRE-TEST BUMPER ENGAGEMENT - VIEW 2

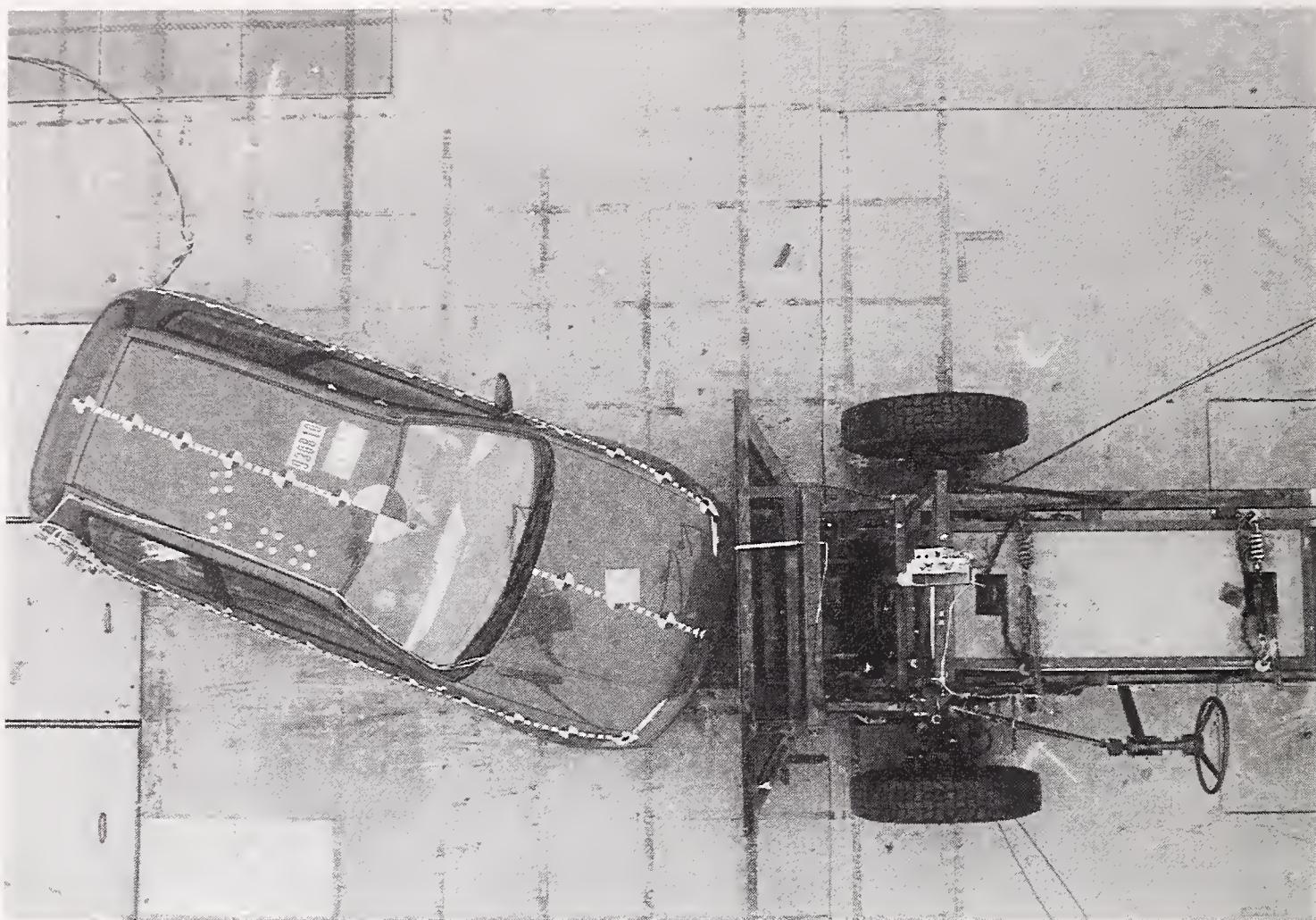


Figure A-11. PRE-TEST OVERHEAD - VIEW 1

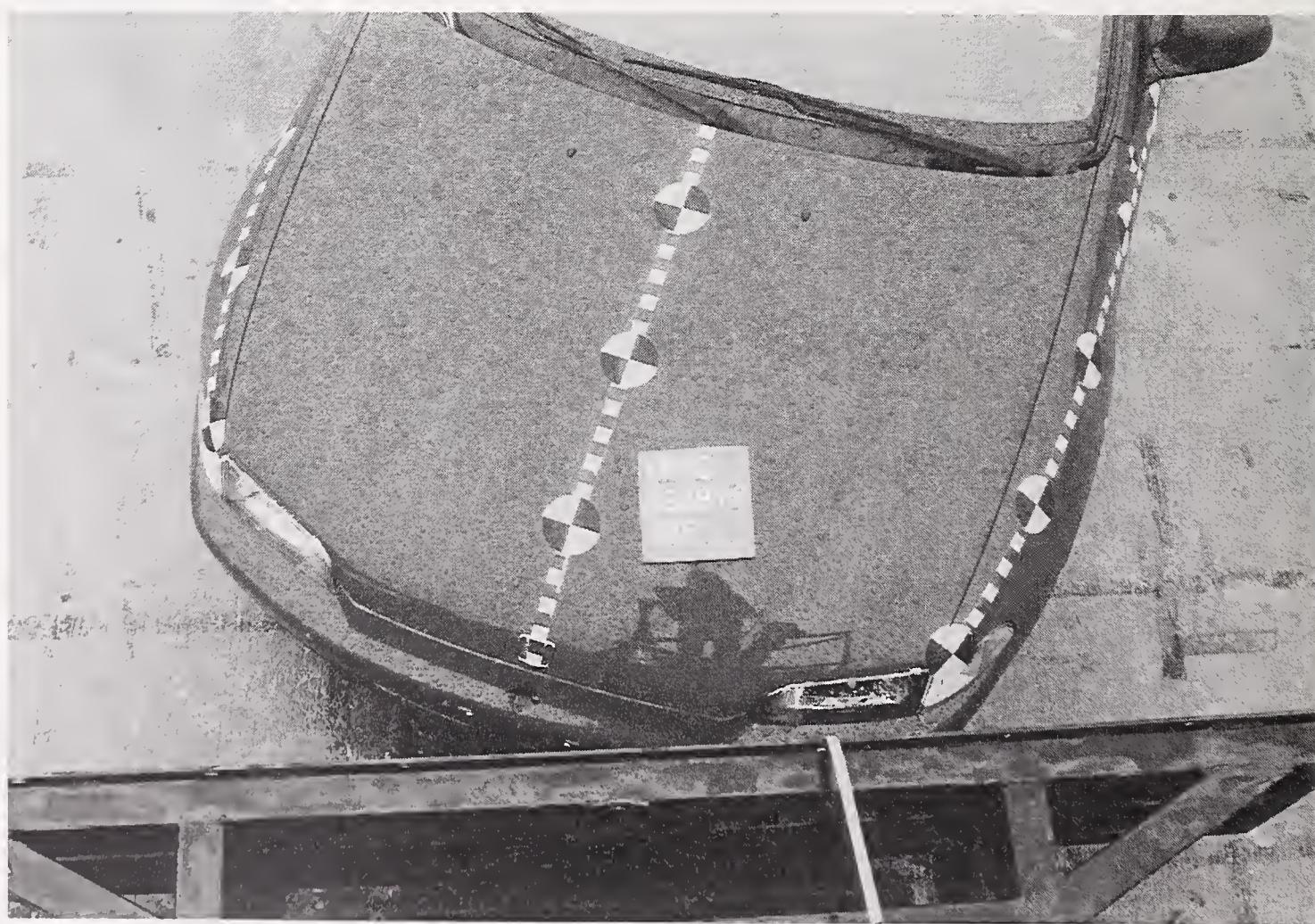


Figure A-12. PRE-TEST OVERHEAD - VIEW 2

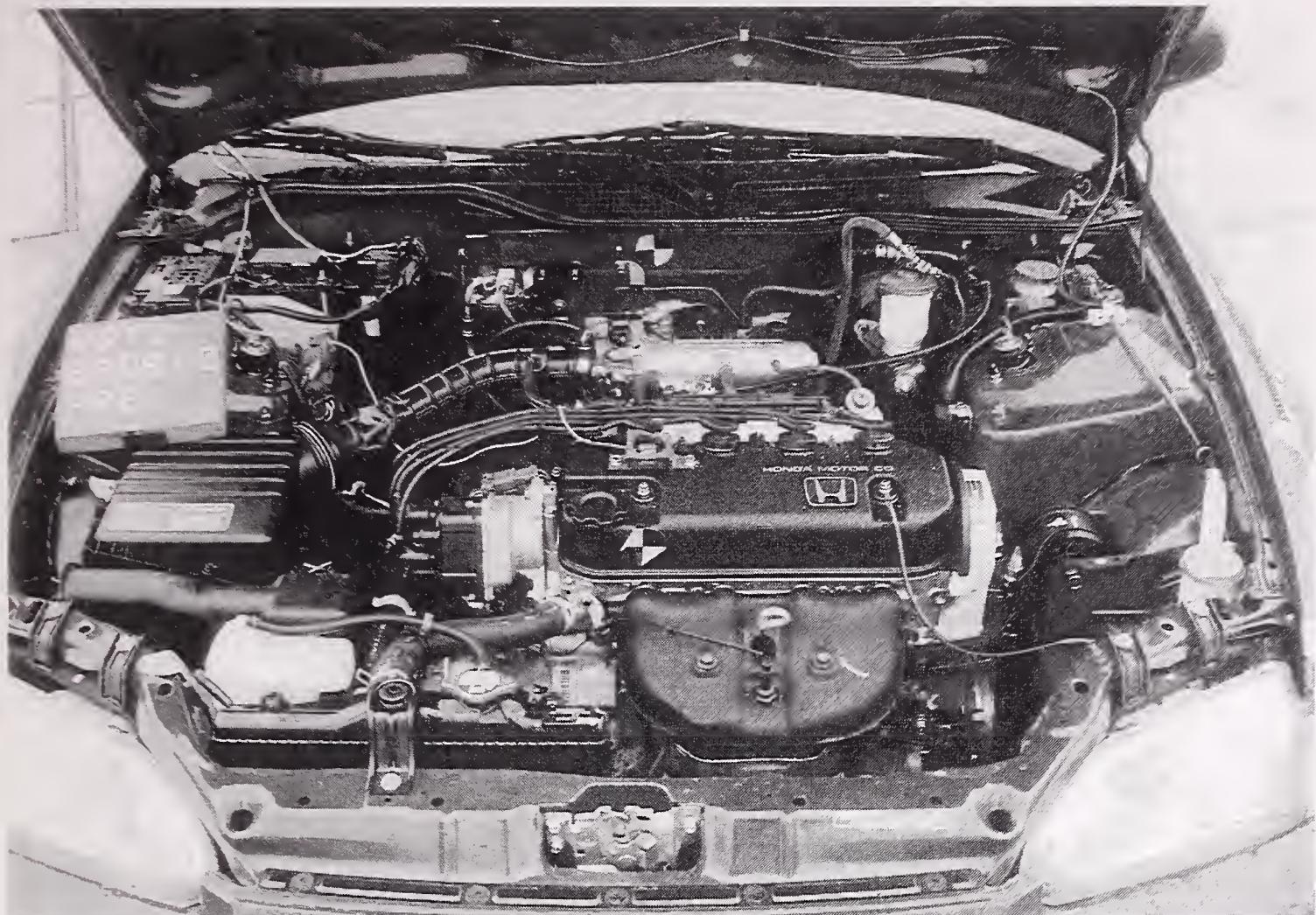


Figure A-13. PRE-TEST VEHICLE ENGINE COMPARTMENT VIEW



Figure A-14. PRE-TEST VEHICLE WINDSHIELD VIEW



Figure A-15. POST-TEST VEHICLE WINDSHIELD VIEW



Figure A-16. POST-TEST TRUCK LEFT SIDE VIEW

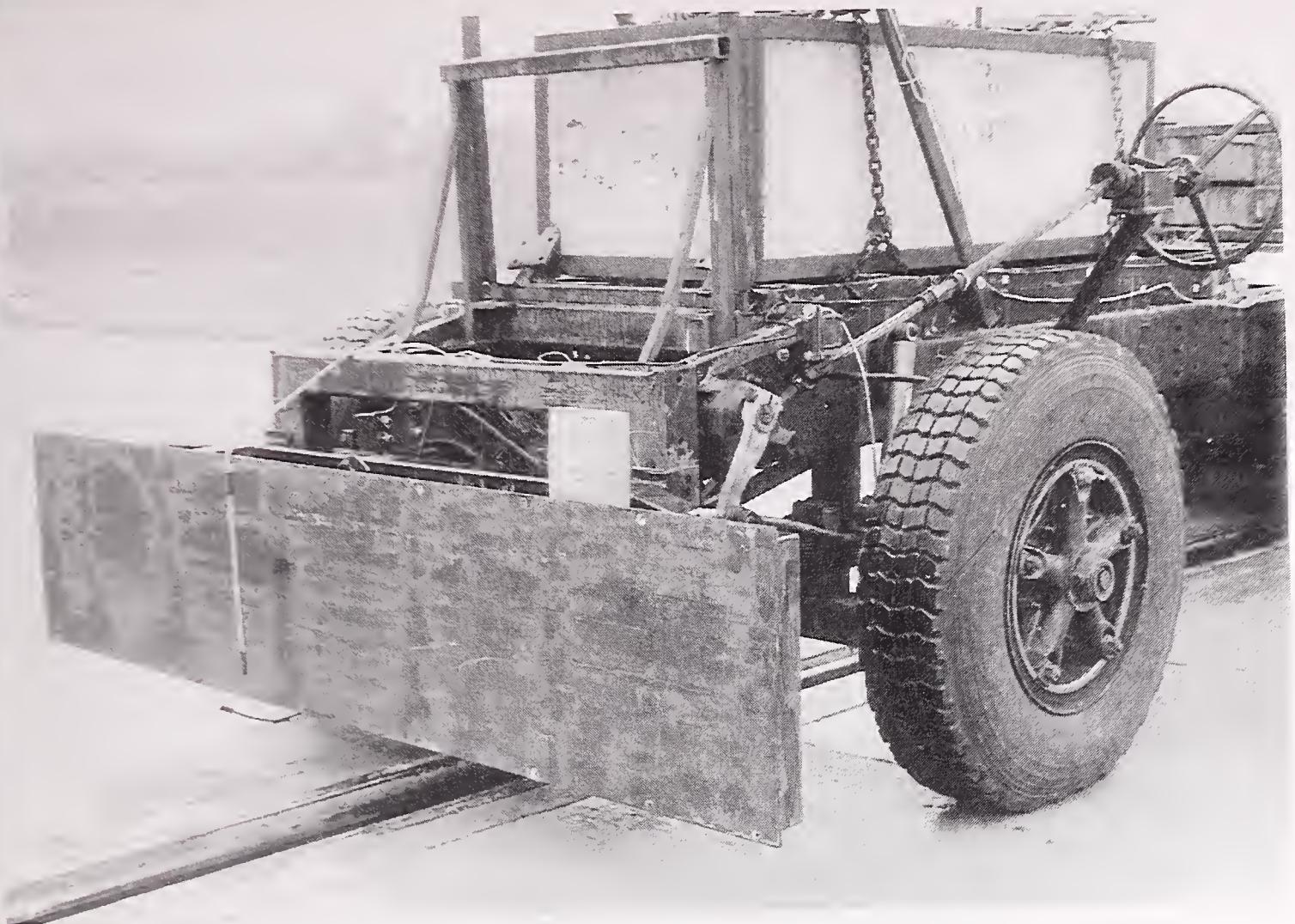


Figure A-17. PRE-TEST TRUCK LEFT FRONT VIEW



Figure A-18. POST-TEST TRUCK LEFT FRONT VIEW

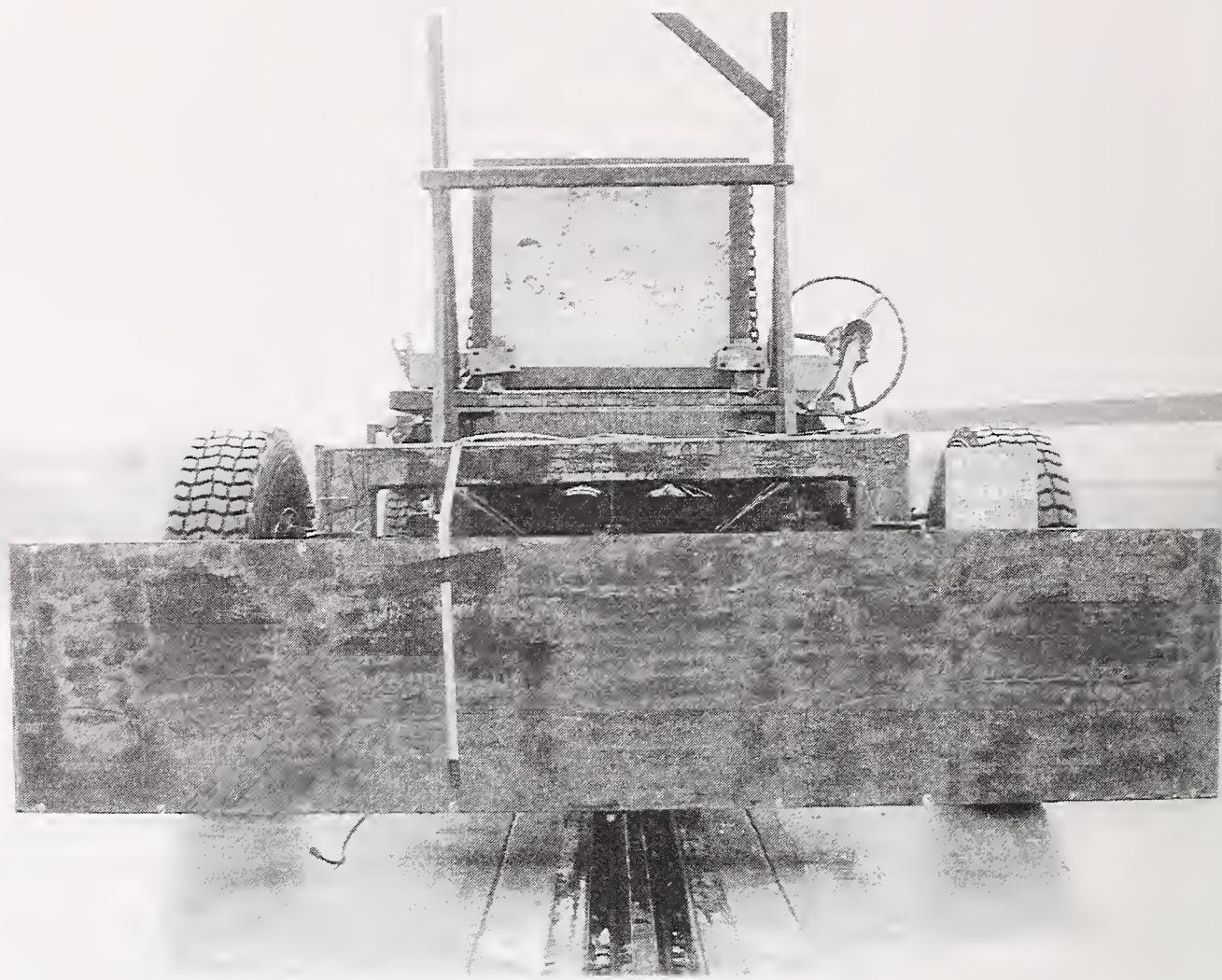


Figure A-19. PRE-TEST TRUCK FRONT VIEW

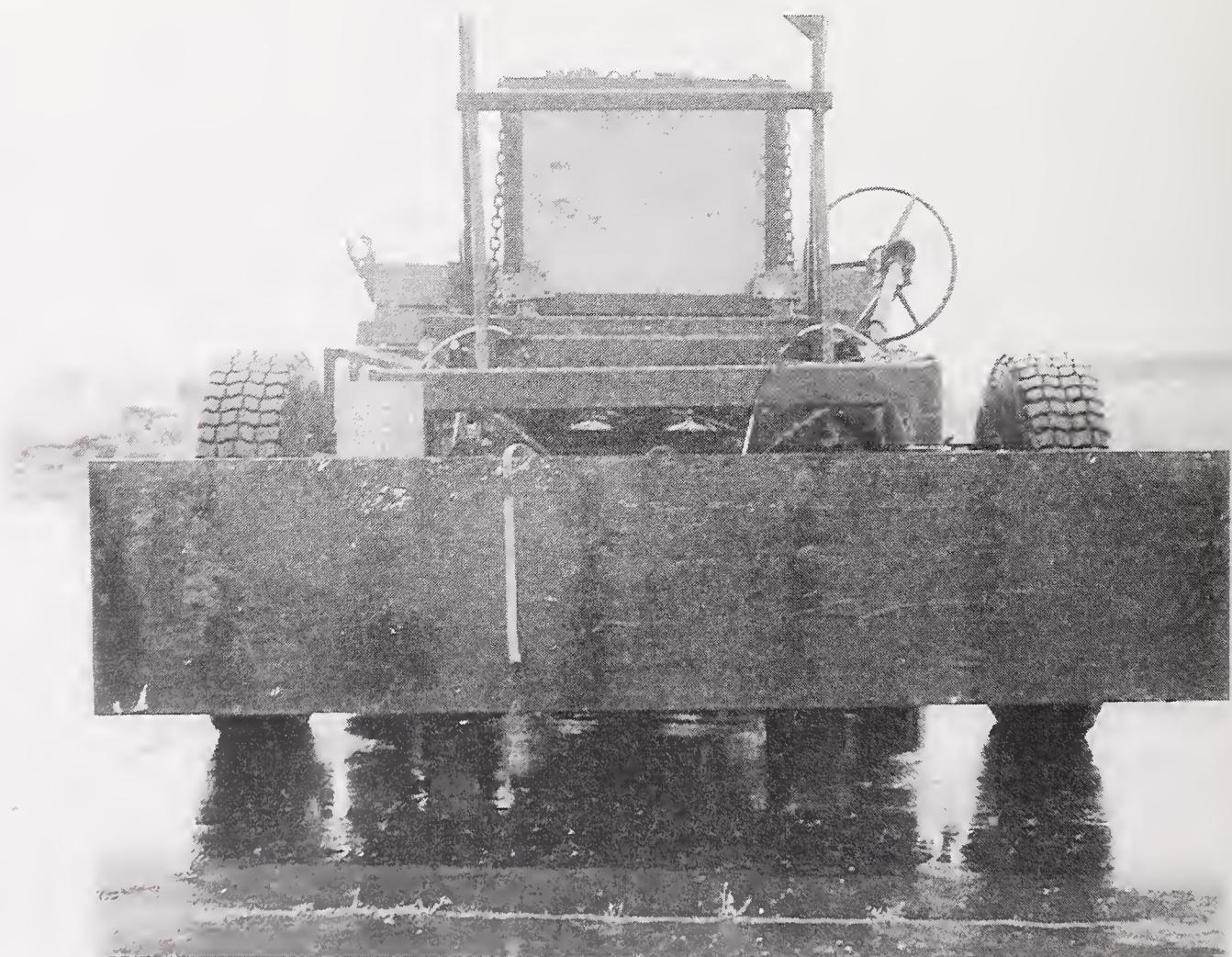


Figure A-20. POST-TEST TRUCK FRONT VIEW

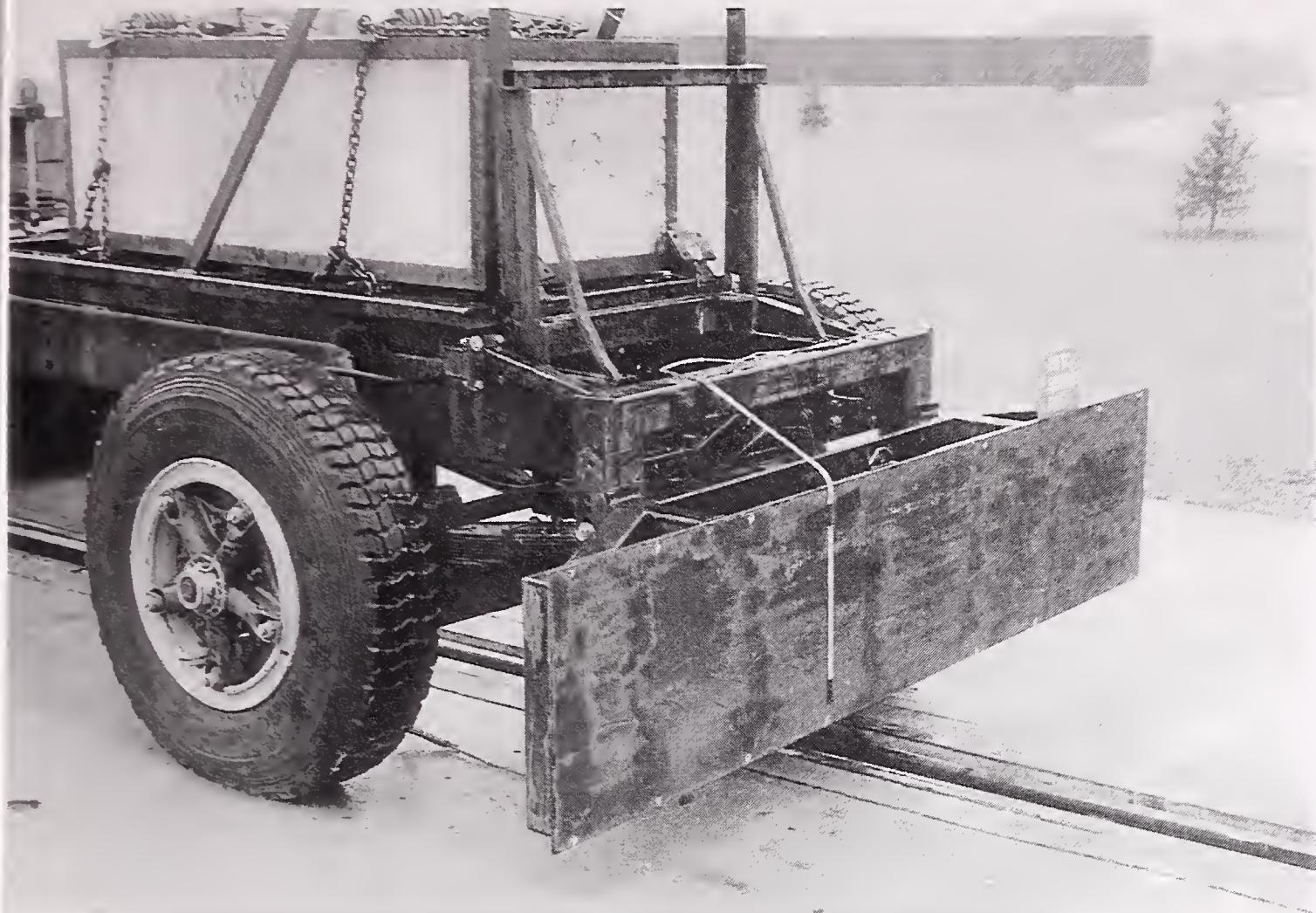


Figure A-21. PRE-TEST TRUCK RIGHT FRONT VIEW

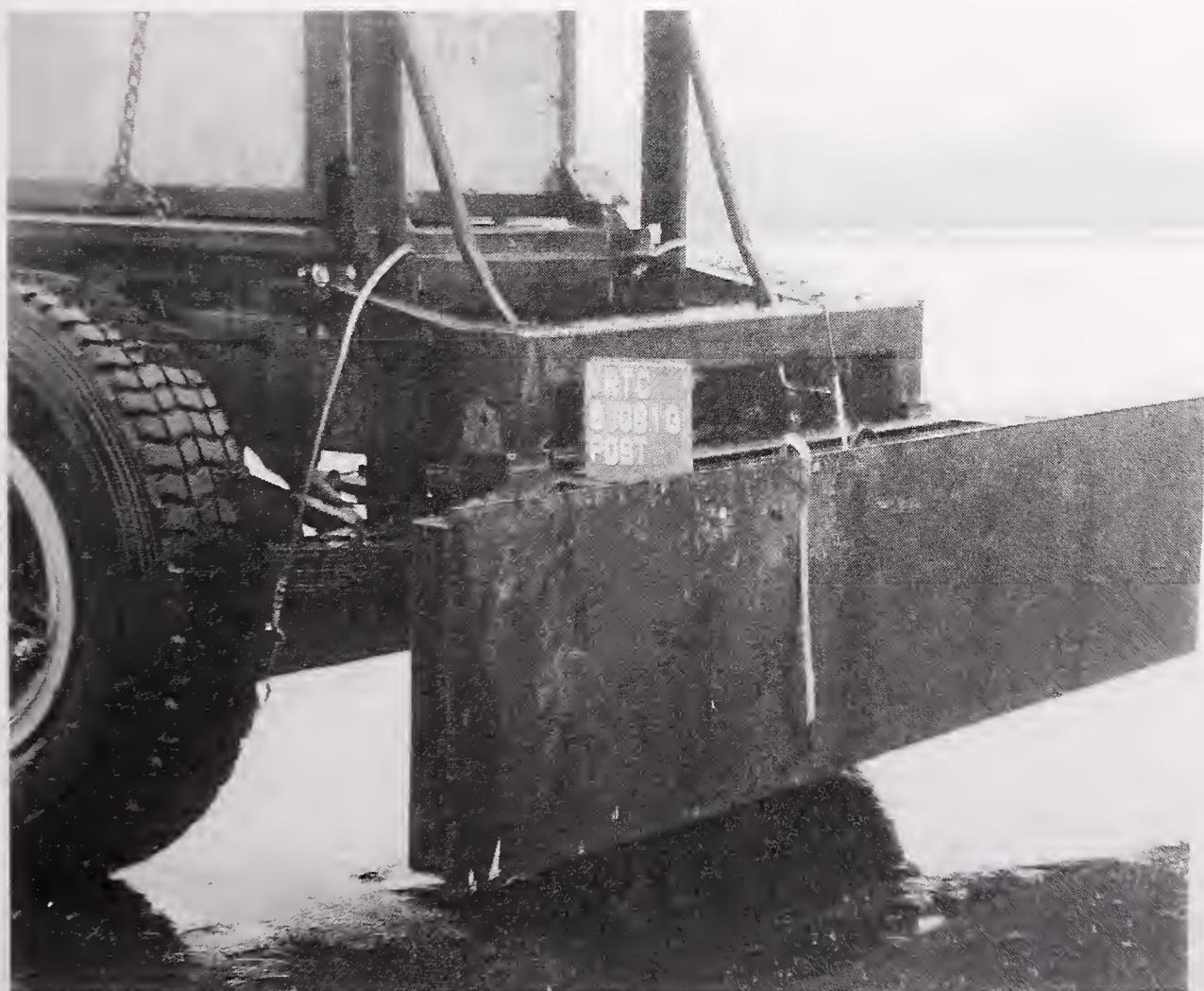


Figure A-22. POST-TEST TRUCK RIGHT FRONT VIEW



Figure A-23. POST-TEST TRUCK RIGHT SIDE VIEW



Figure A-24. PRE-TEST DUMMY VIEW



Figure A-25. POST-TEST DUMMY VIEW



Figure A-26. PRE-TEST VEHICLE INTERIOR AND DUMMY - VIEW 1



Figure A-27. PRE-TEST VEHICLE INTERIOR AND DUMMY - VIEW 2



Figure A-28. POST-TEST DUMMY HEAD CONTACT VIEW

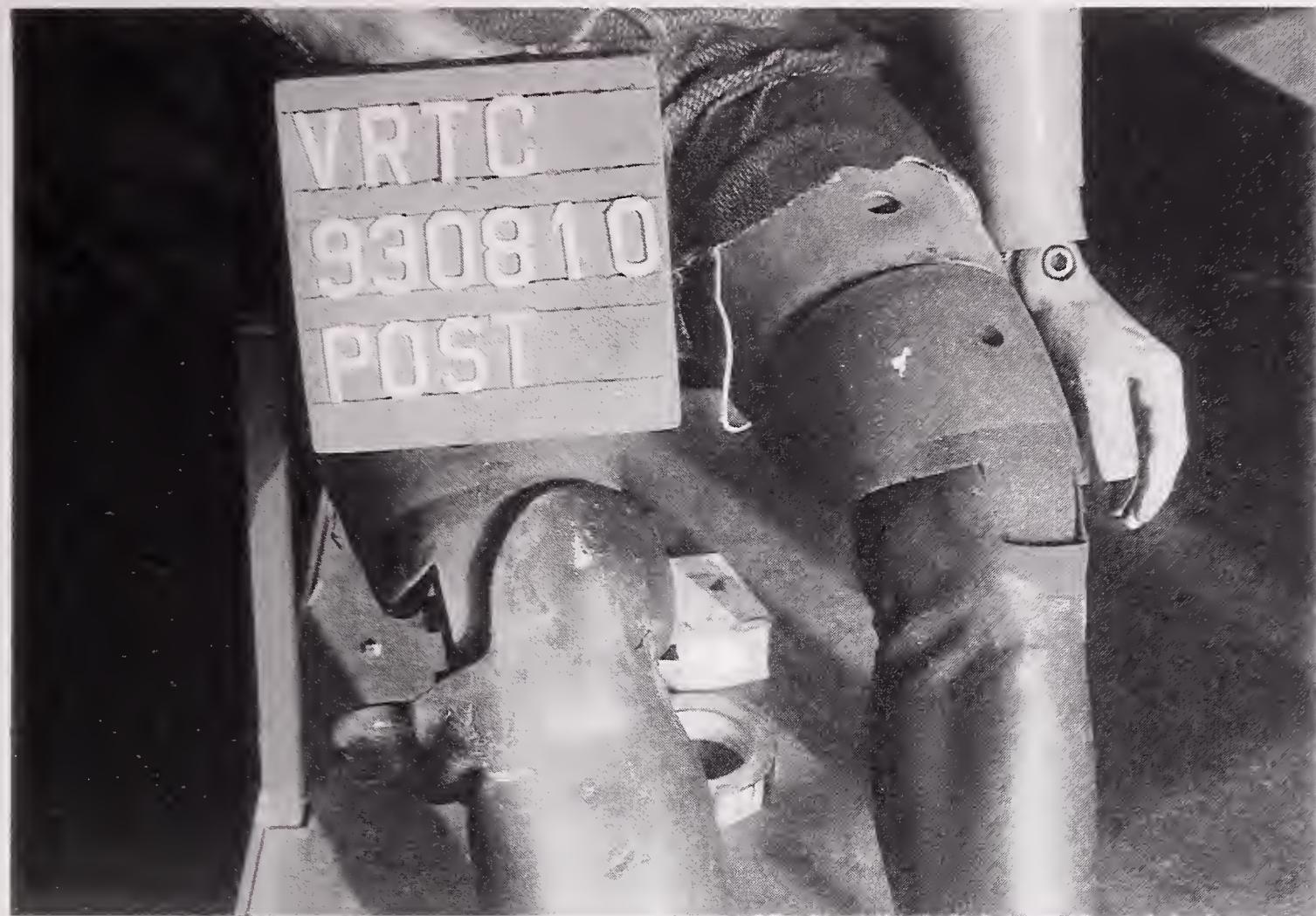


Figure A-29. POST-TEST DUMMY KNEE CONTACT VIEW



Figure A-30. POST-TEST VEHICLE DAMAGE CLOSE-UP - VIEW 1

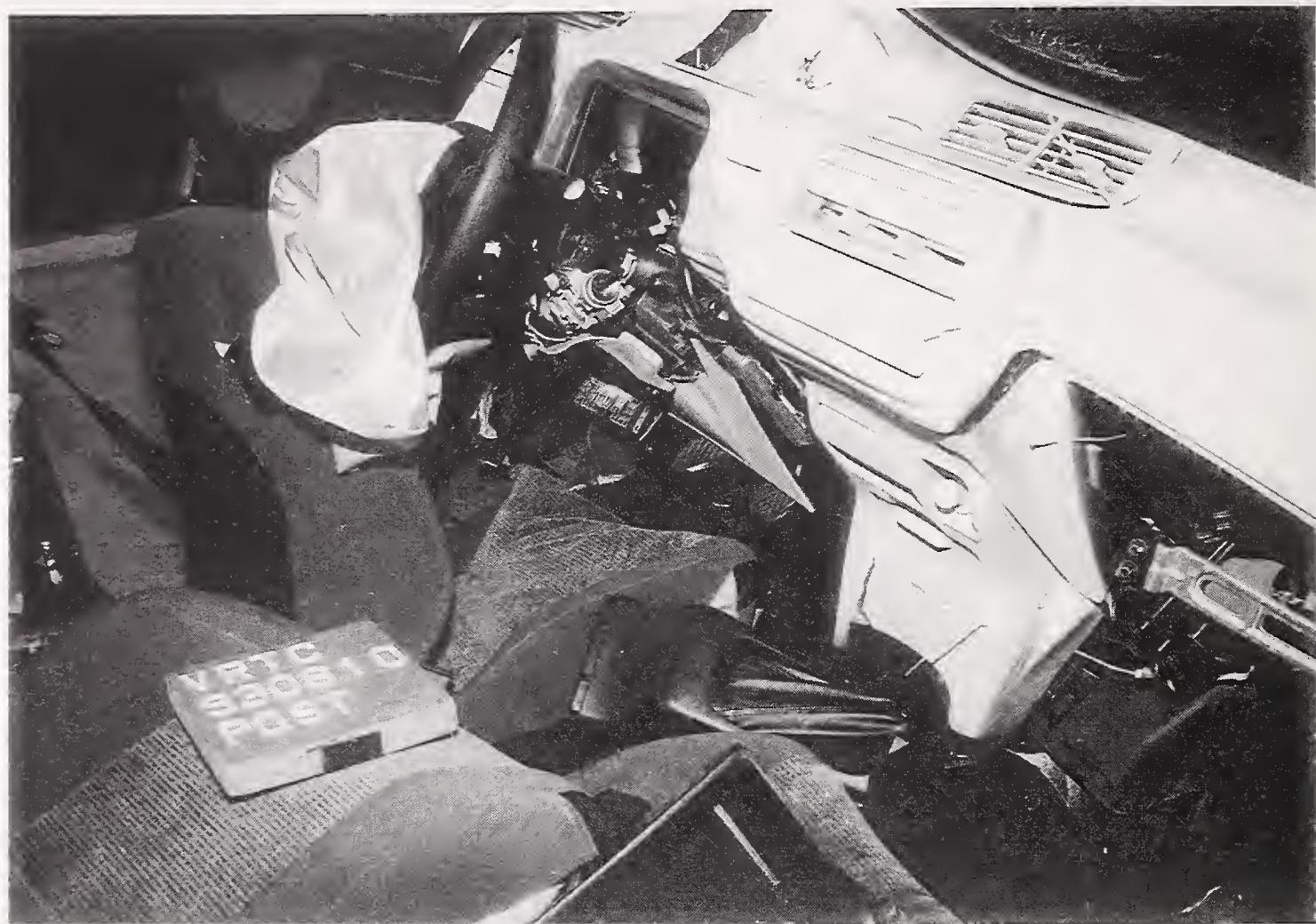


Figure A-31. POST-TEST VEHICLE DAMAGE CLOSE-UP - VIEW 2

APPENDIX B

DATA PLOTS



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER HEAD X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TIRE INC.

160

80

0

-80

-160

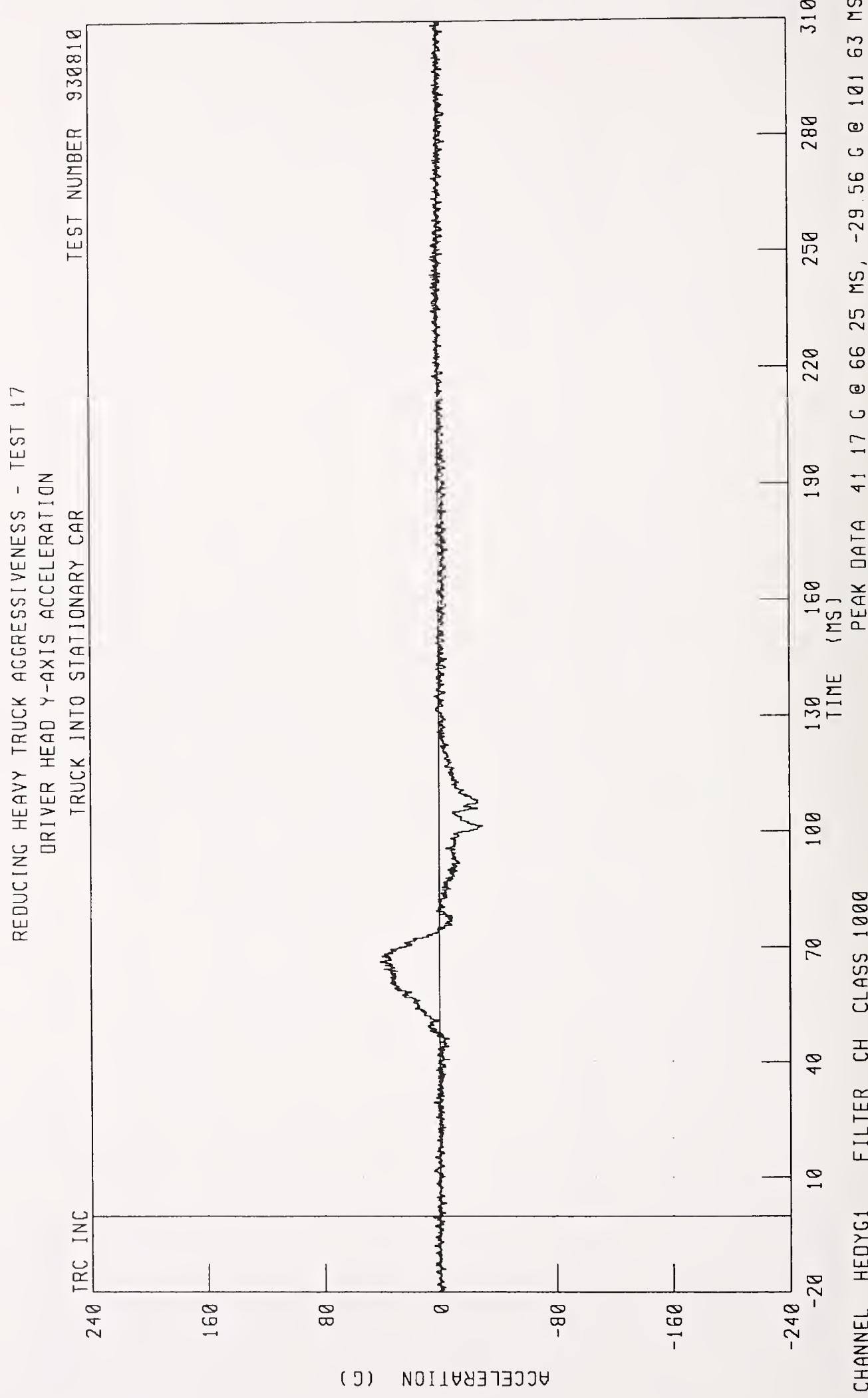
-240

-320

ACCELERATION (G)

TIME (MS) PEAK DATA 65 92 G @ 108 13 MS, -130 12 G @ 63.75 MS
100 130 160 190 220 250 280 310

CHANNEL HEDXG1 FILTER CH CLASS 1000



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER HEAD Z-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

160

80

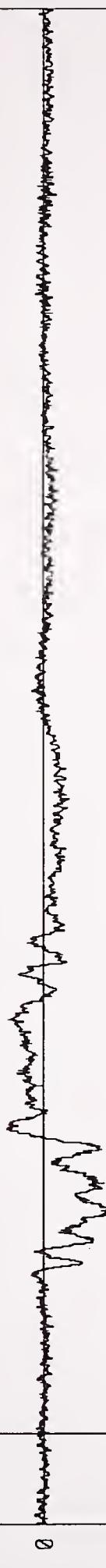
0

-80

-160

-240

ACCELERATION (G)

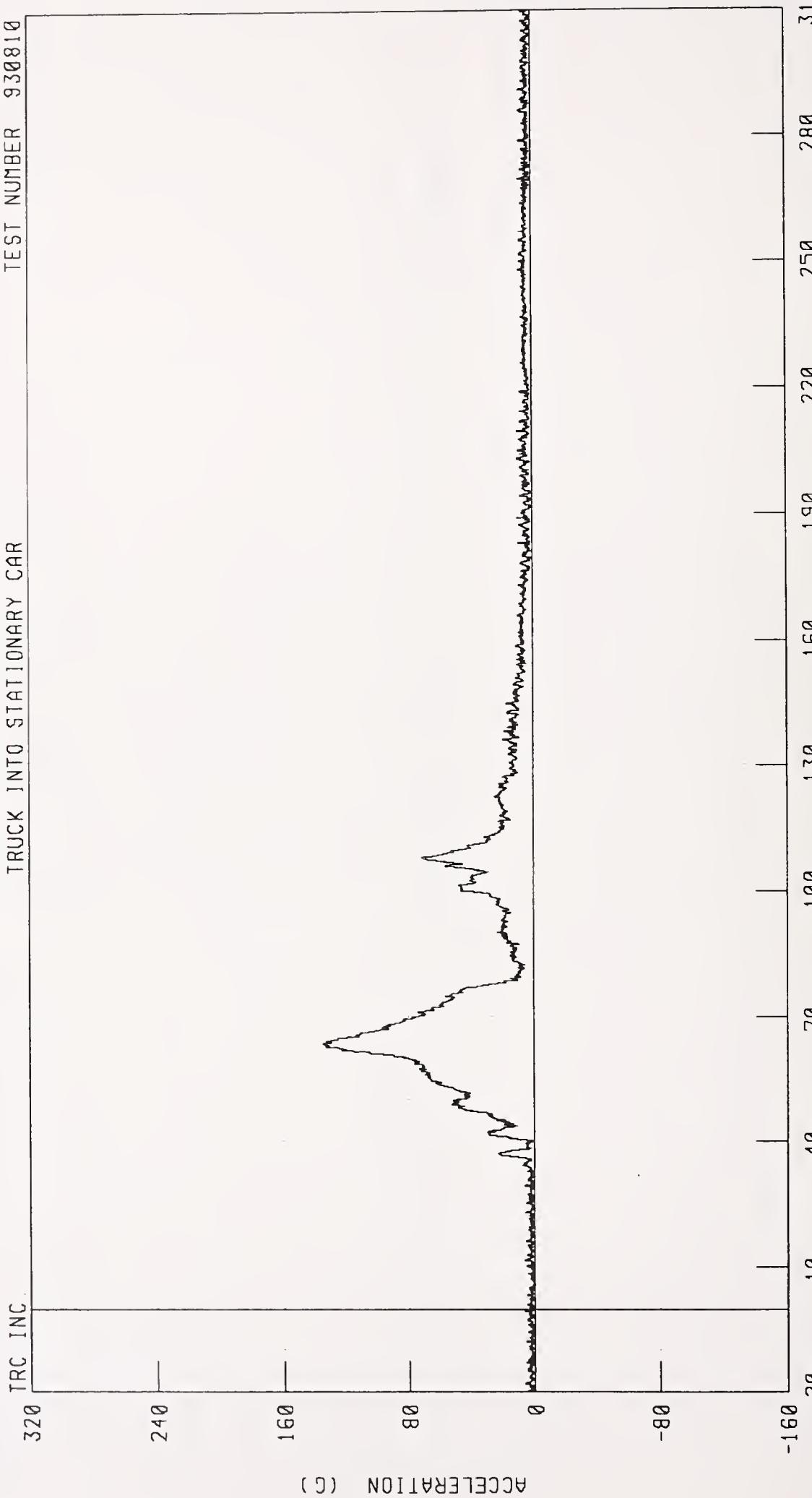


CHANNEL HEDZG1 FILTER CH CLASS 1000 PEAK DATA 22 03 G @ 66 38 MS, -39 34 G @ 49 00 MS

TIME (MS)

100 40 70 100 130 160 190 220 250 280 310

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER HEAD RESULTANT ACCELERATION
TRUCK INTO STATIONARY CAR
TEST NUMBER 930810



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER HEAD X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

IRC INC

60

30

0

-30

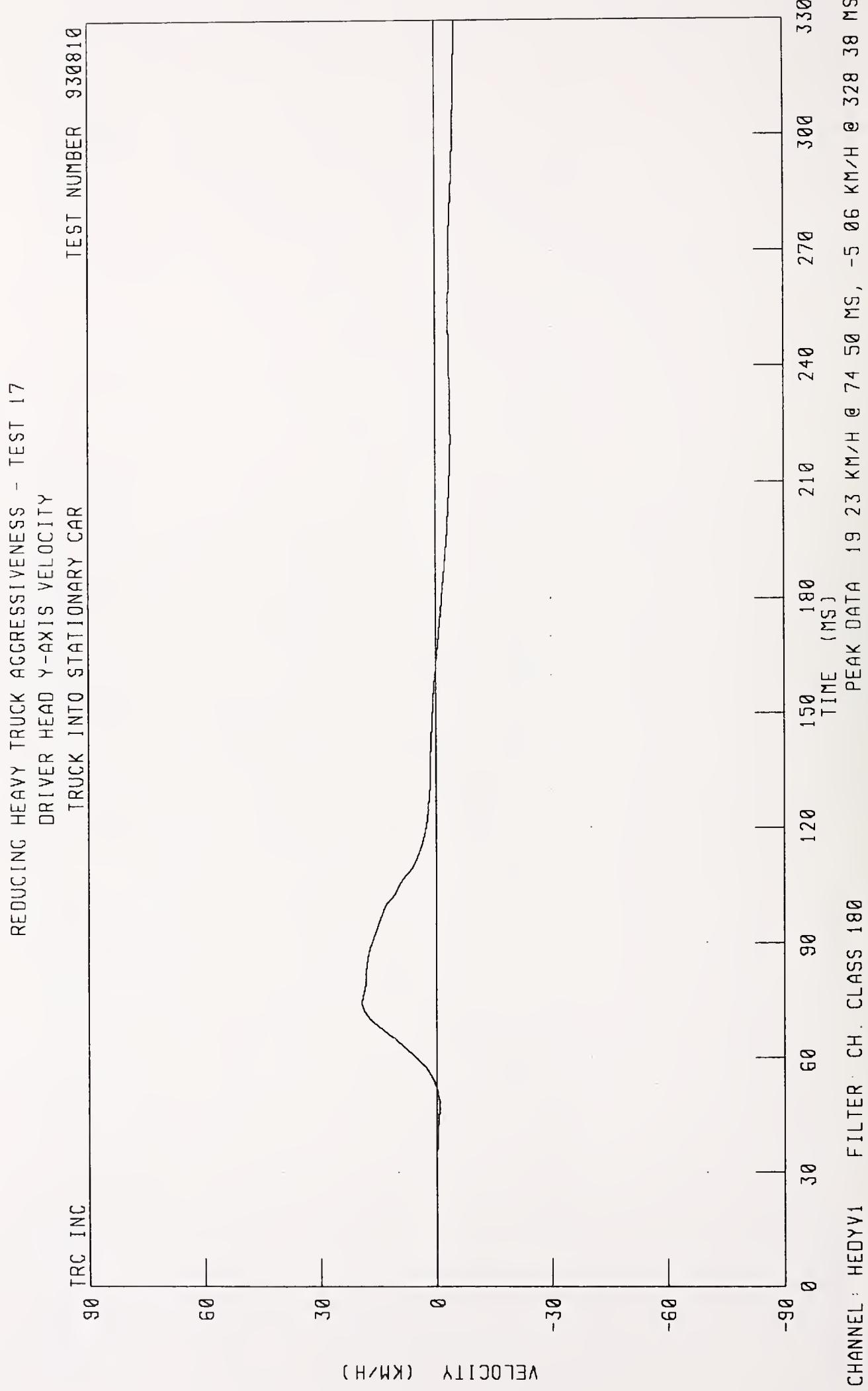
-60

-90

VELOCITIY (KM/H)

CHANNEL HEDXV1 FILTER CH CLASS 180 PEAK DATA 0 22 KM/H @ 36 00 MS, -75 90 KM/H @ 89 38 MS

TIME (MS) 150 180 210 240 270 300 330



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER HEAD Z-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

IRC INC

60

30

0

-30

-60

-90

VELOCITY (KM/H)

0 30 60 90 120 150 180 210 240 270 300 330

TIME (MS)

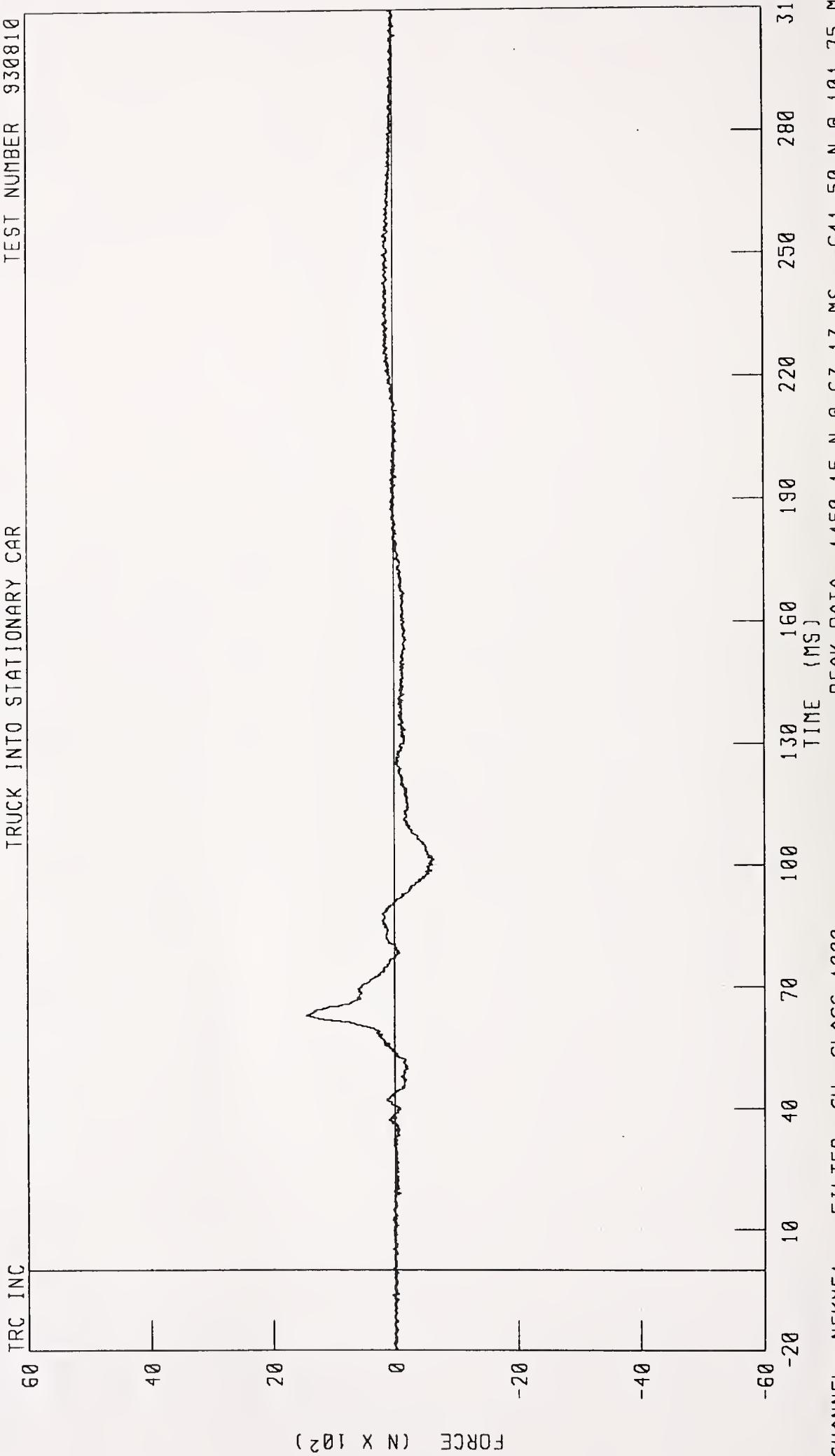
PEAK DATA 0 18 KM/H @ 5 38 MS, -30 76 KM/H @ 330 00 MS

CHANNEL: HEDZV1 FILTER: CH CLASS 180

REDUCING HEAVY TRUCK AGGRESSION - TEST 17

DRIVER NECK X-AXIS SHEAR FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17

DRIVER NECK Y-AXIS SHEAR FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

40

20

0

-20

-40

-60

FORCE (N X 10²)

TIME (MS) 130 160 190 220 250 280 310
PEAK DATA 554 95 N @ 58 13 MS, -90 35 N @ 227 25 MS

CHANNEL NEKYF1 FILTER CH CLASS 1000

REDUCING HEAVY TRUCK AGGRESSION - TEST 17
DRIVER NECK Z-AXIS AXIAL FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

80

60

40

20

0

FORCE (N X 10²)

-20 10 40 70 100 130 160 190 220 250 280 310
TIME (MS)

CHANNEL: NEKZF1 FILTER CH. CLASS 1000

PEAK DATA 3467 81 N @ 62 38 MS, -775 23 N @ 90 38 MS

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17

DRIVER NECK RESULTANT FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

80

60

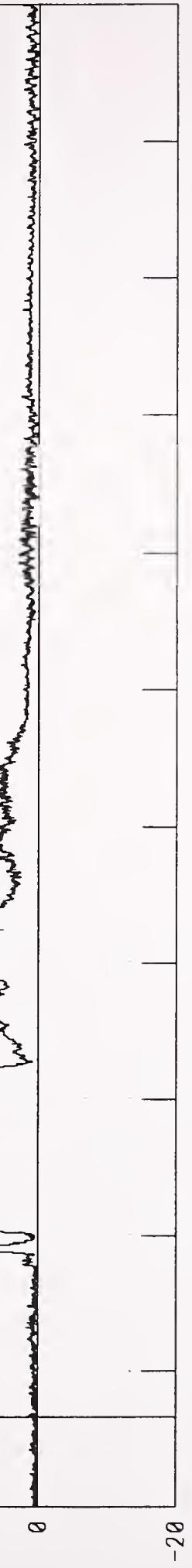
40

20

0

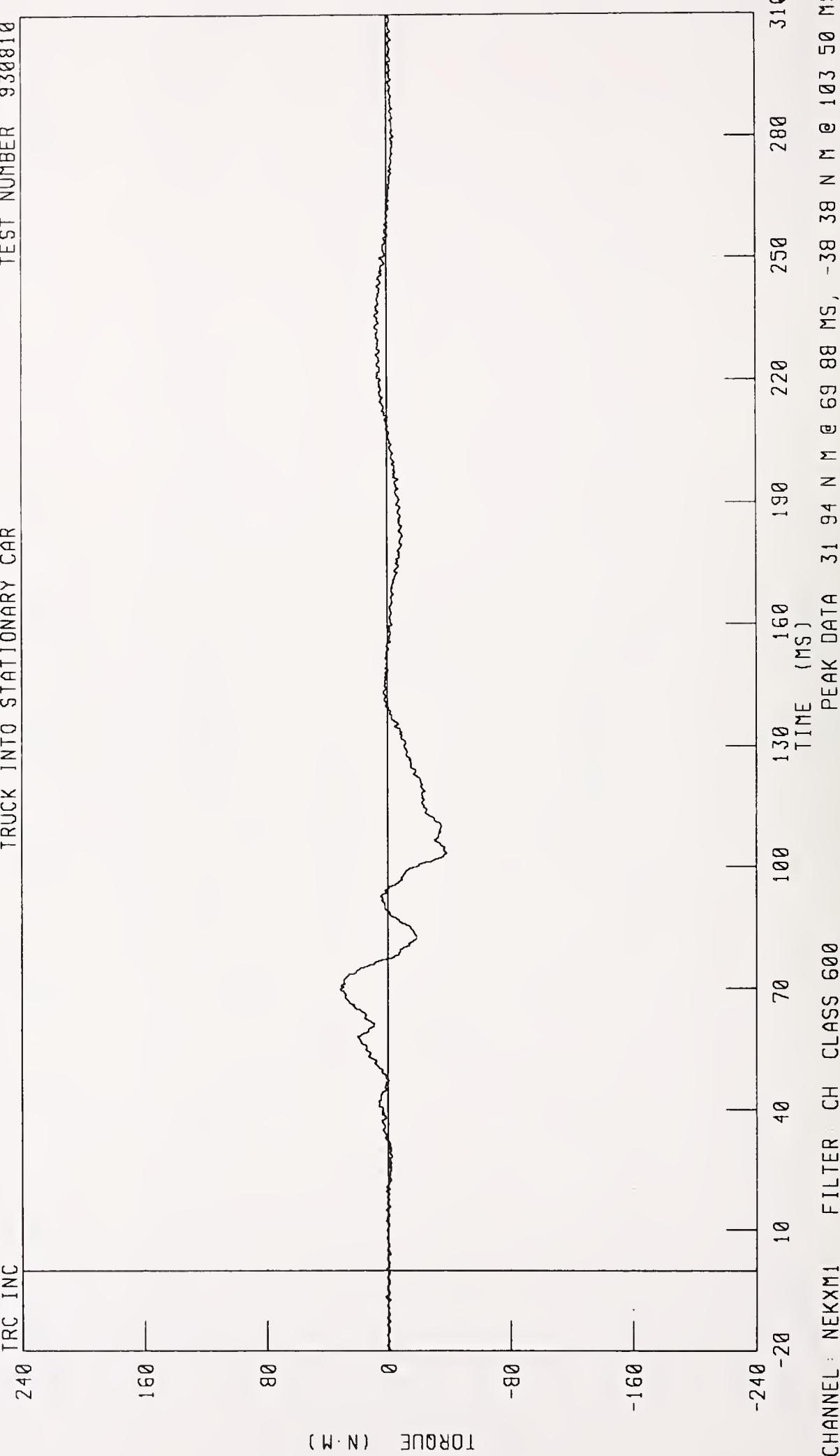
-20

FORCE (N X 10²)



CHANNEL NEKRF1 FILTER CH CLASS 1000
PEAK DATA 3704 56 N @ 62 38 MS, 1 92 N @ -9 13 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER NECK MOMENT ABOUT X AXIS
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
DRIVER NECK MOMENT ABOUT Y AXIS
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TIRE INC

160

80

0

-80

-160

-240

TORQUE (N·M)



CHANNEL NEKYM1 FILTER: CH CLASS 600

PEAK DATA 70 92 N M @ 99 00 MS, -119 51 N M @ 64 00 MS

REDUCING HEAVY TRUCK AGGRESSION - TEST 17
DRIVER NECK MOMENT ABOUT Z AXIS
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

-240 -20 10 40 70 100

TORQUE (N M)

130 160 190 220 250 280 310

TIME (MS)

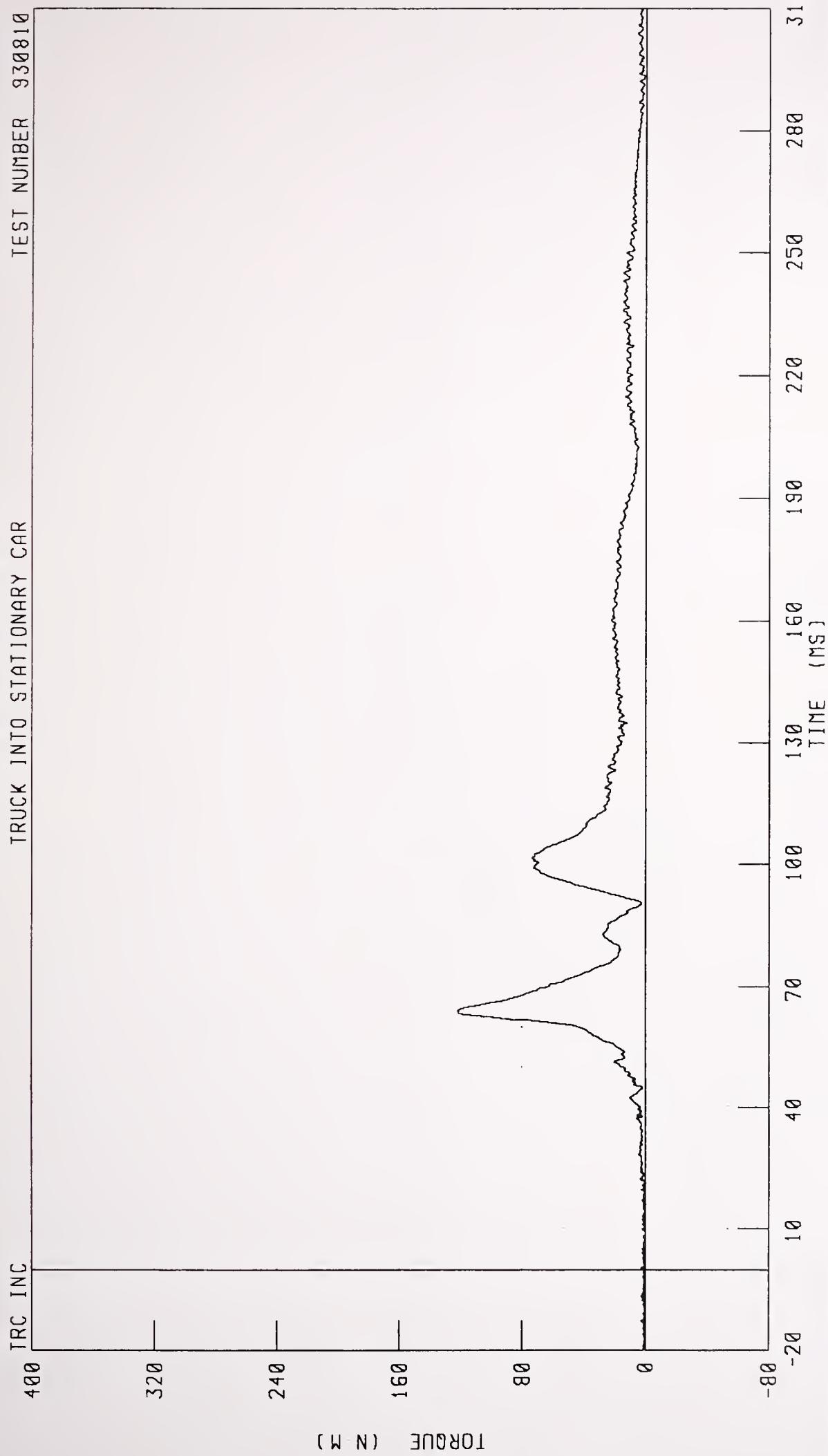
PEAK DATA 24 25 N M @ 65 00 MS, -14 38 N M @ 142 13 MS

CHANNEL - NEKZM1 FILTER CH CLASS 600

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

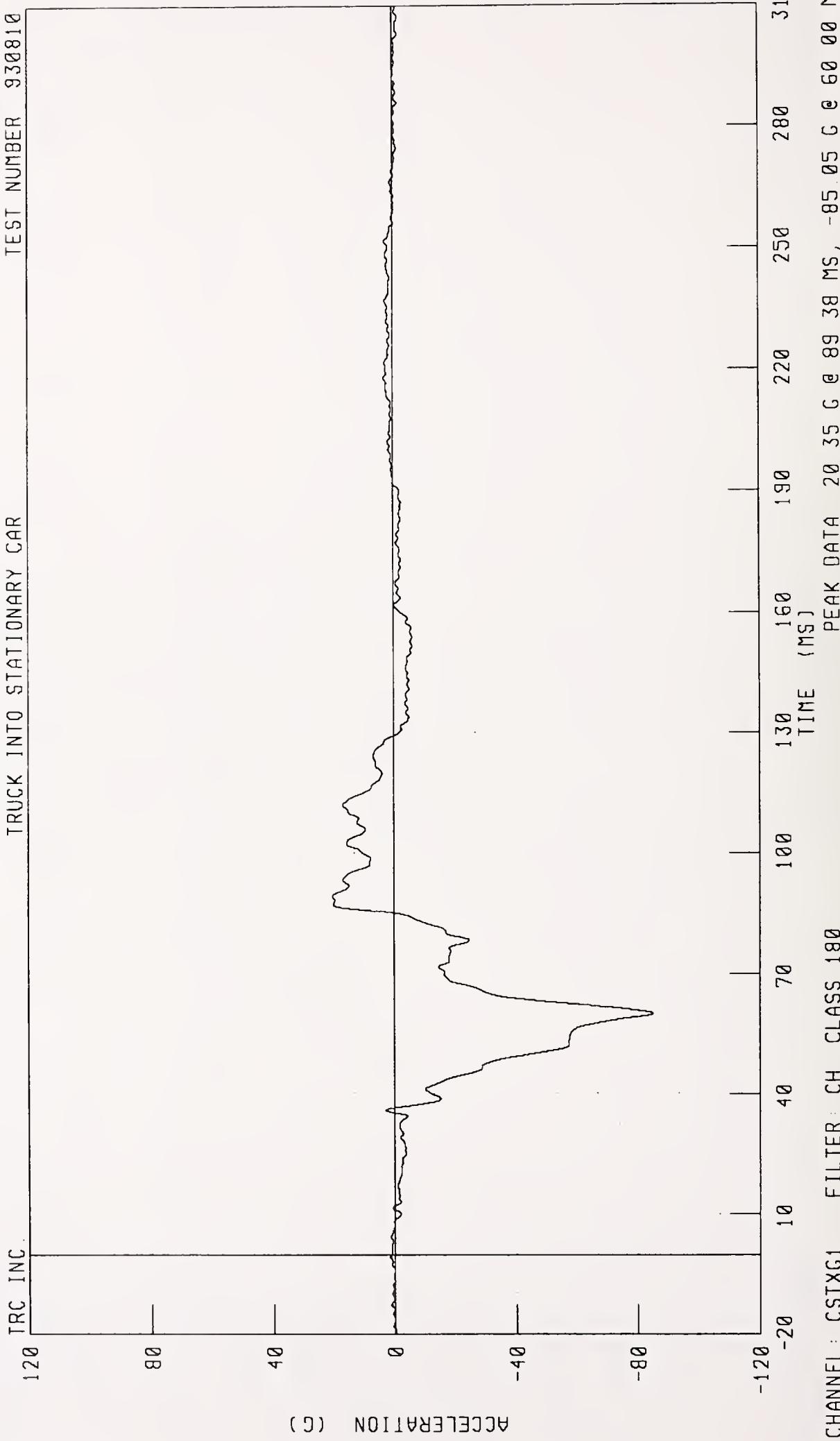
DRIVER NECK MOMENT RESULTANT
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

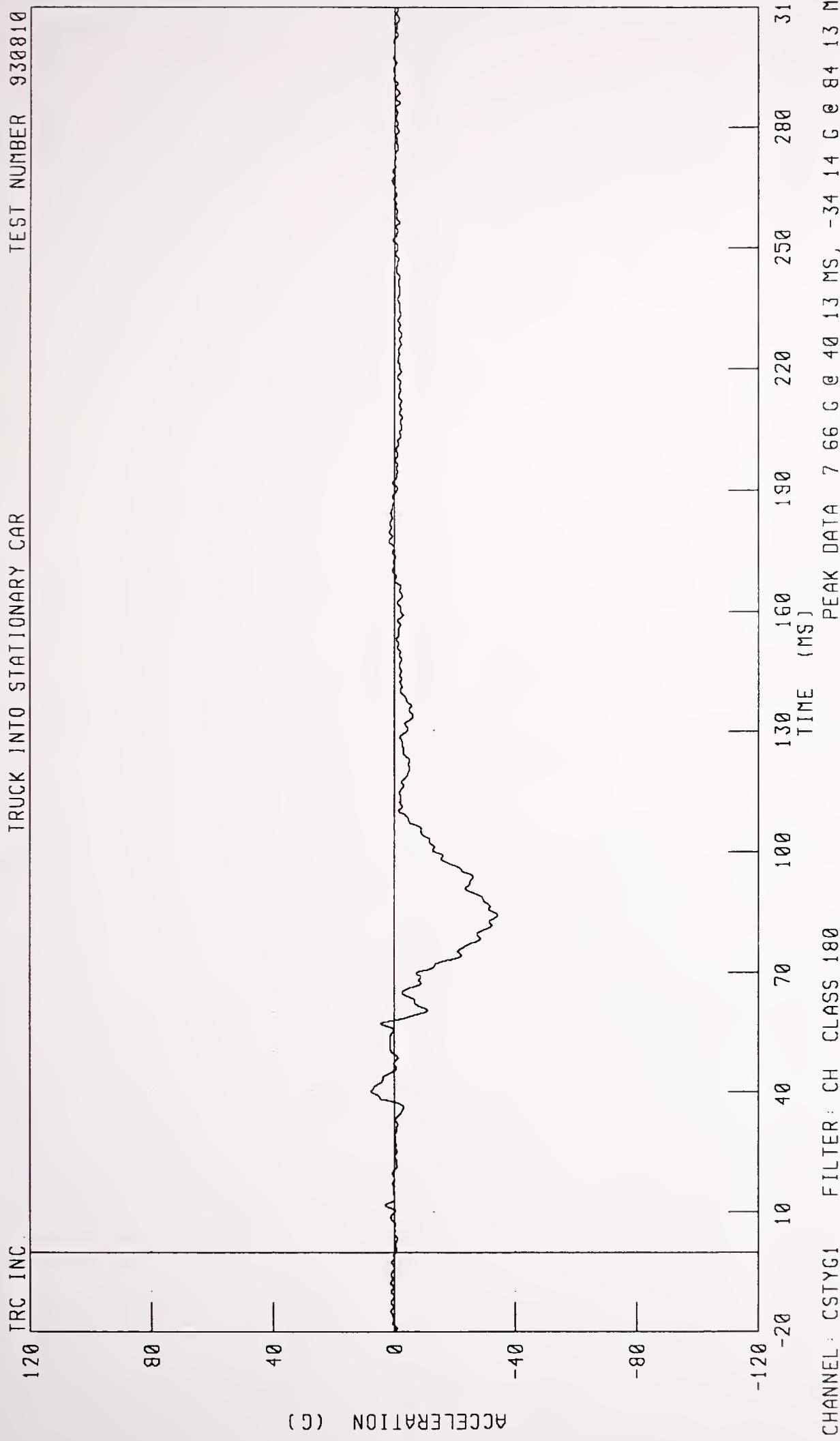


CHANNEL NEKRM1 FILTER: CH CLASS 600 PEAK DATA 122 43 N @ 64 00 MS, 0 07 N M @ 8 88 MS

REDUCING HEAVY TRUCK AGGRESSION - TEST 17
DRIVER CHEST X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER CHEST Y-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER CHEST Z-AXIS ACCELERATION

TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

120 TRC INC

80

40

0

-40

-80

-120

ACCELERATION (G)

CHANNEL: CSTZG1 FILTER: CH CLASS 180

PEAK DATA 22 23 G @ 81 75 MS, -24.47 G @ 65.88 MS

-20

10

40

70

100

130

160

190

220

250

280

310

TIME [MS]

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
DRIVER CHEST RESULTANT ACCELERATION

TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

120

80

40

0

-40

-80

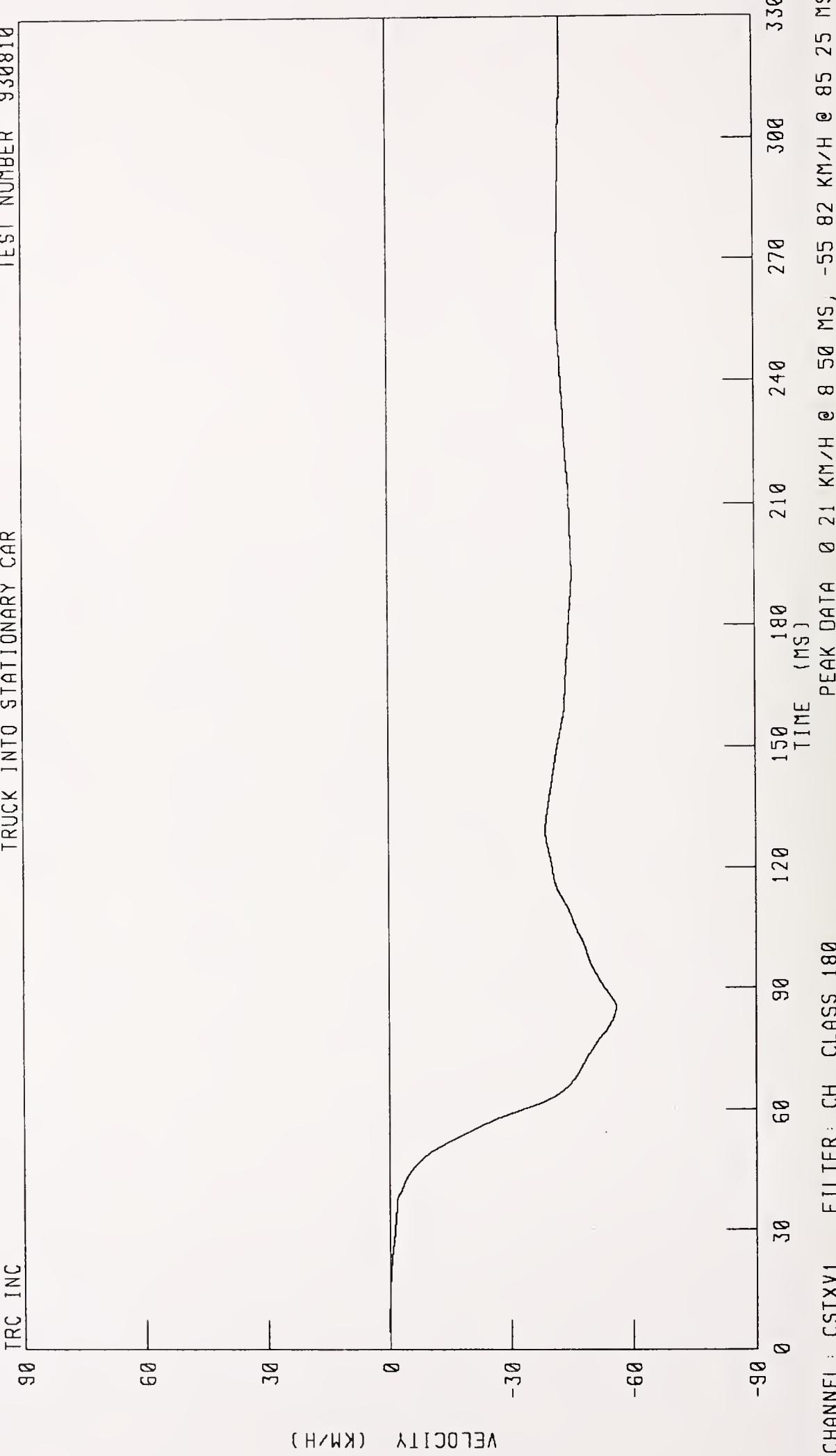
-120

ACCELERATION (G)

-20 10 40 70 100 130 160 190 220 250 280 310
TIME (ms)

CHANNEL CSTRG1 FILTER CH CLASS 180 PEAK DATA 86 29 G @ 60 00 MS, 0 14 G @ 261 63 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER CHEST X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17

DRIVER CHEST Y-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

60

30

0

-30

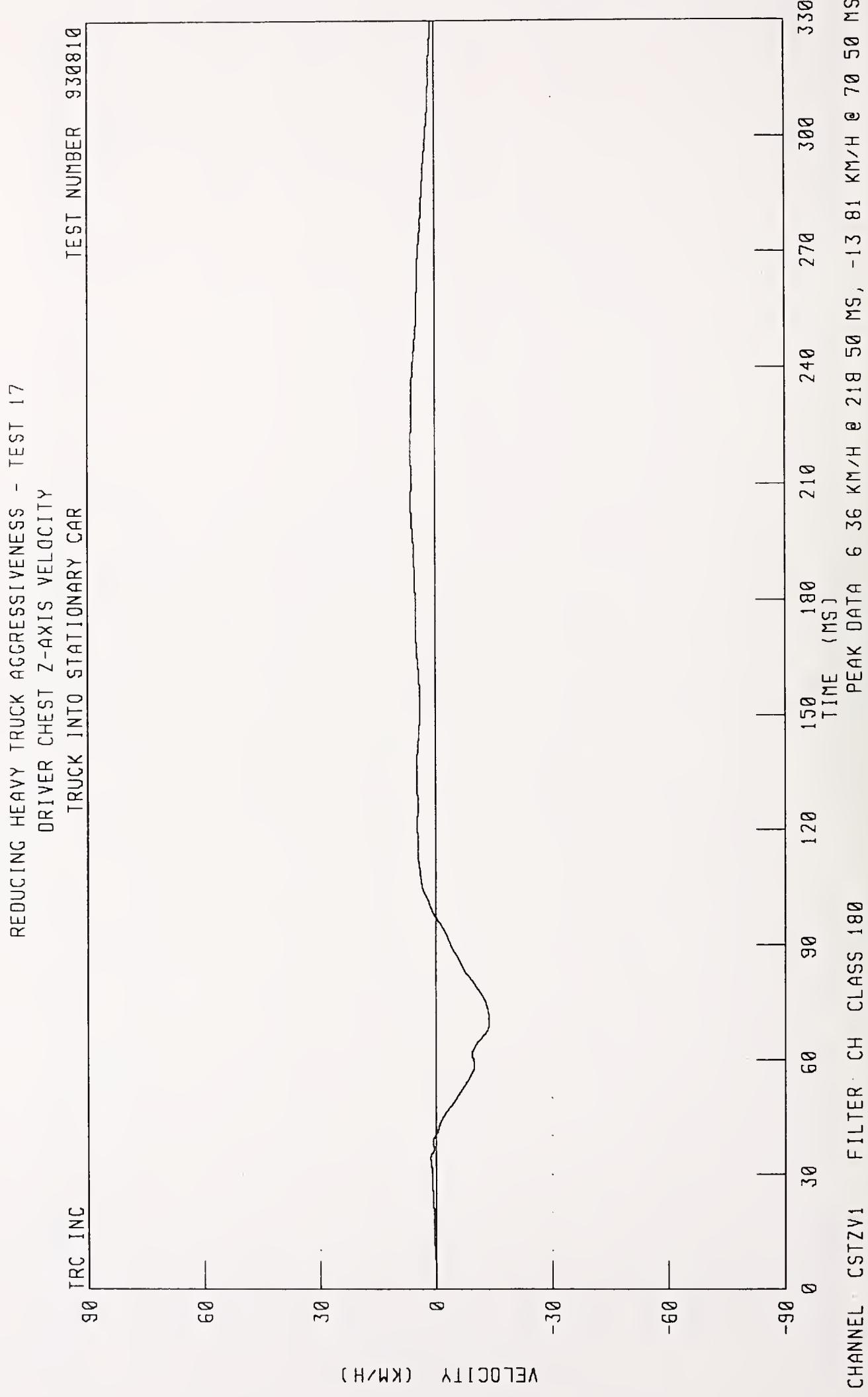
-60

-90

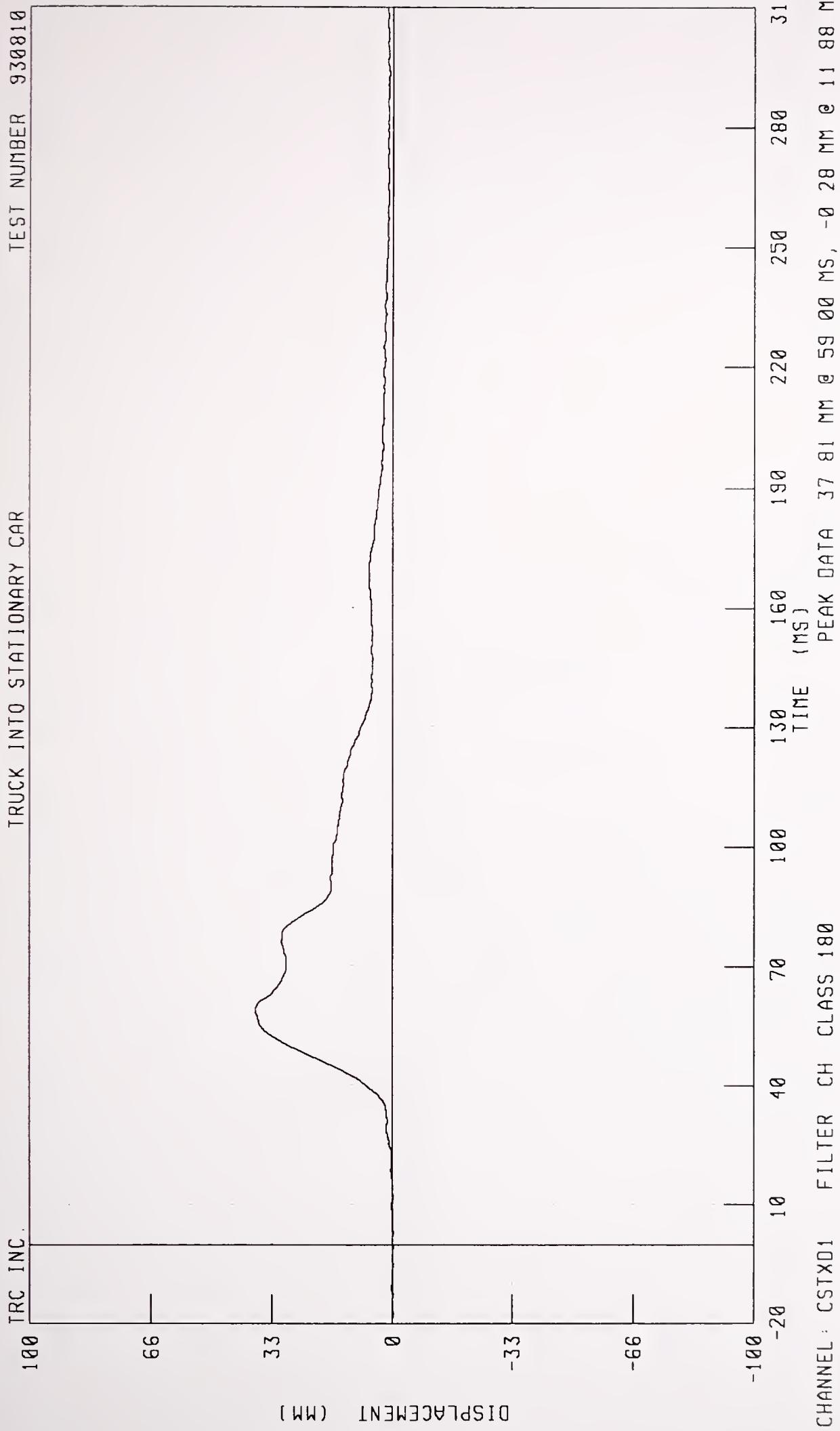
VELOCITY (KM/H)

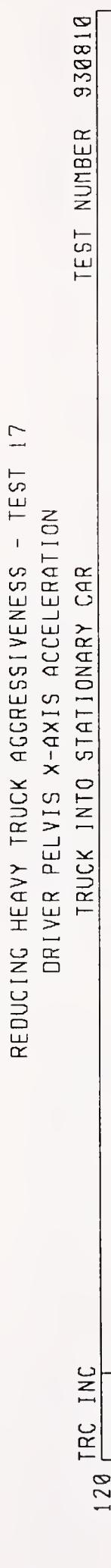
TIME (MS) 150 180 210 240 270 300 330
PEAK DATA 1 26 KM/H @ 57 88 MS, -39 84 KM/H @ 328 75 MS

CHANNEL CSTYV1 FILTER CH CLASS 180



REDUCING HEAVY TRUCK AGGRESSION - TEST 17
DRIVER CHEST DEFLECTION
TRUCK INTO STATIONARY CAR





CHANNEL : PEVXG1 FILTER : CH CLASS 1000

PEAK DATA 17 88 G @ 103 13 MS, -73 81 G @ 33 63 MS

-120 -20 10 40 70 100 130 160 190 220 250 280 310
TIME (MS)

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER PELVIS Y-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

120

80

40

0

-40

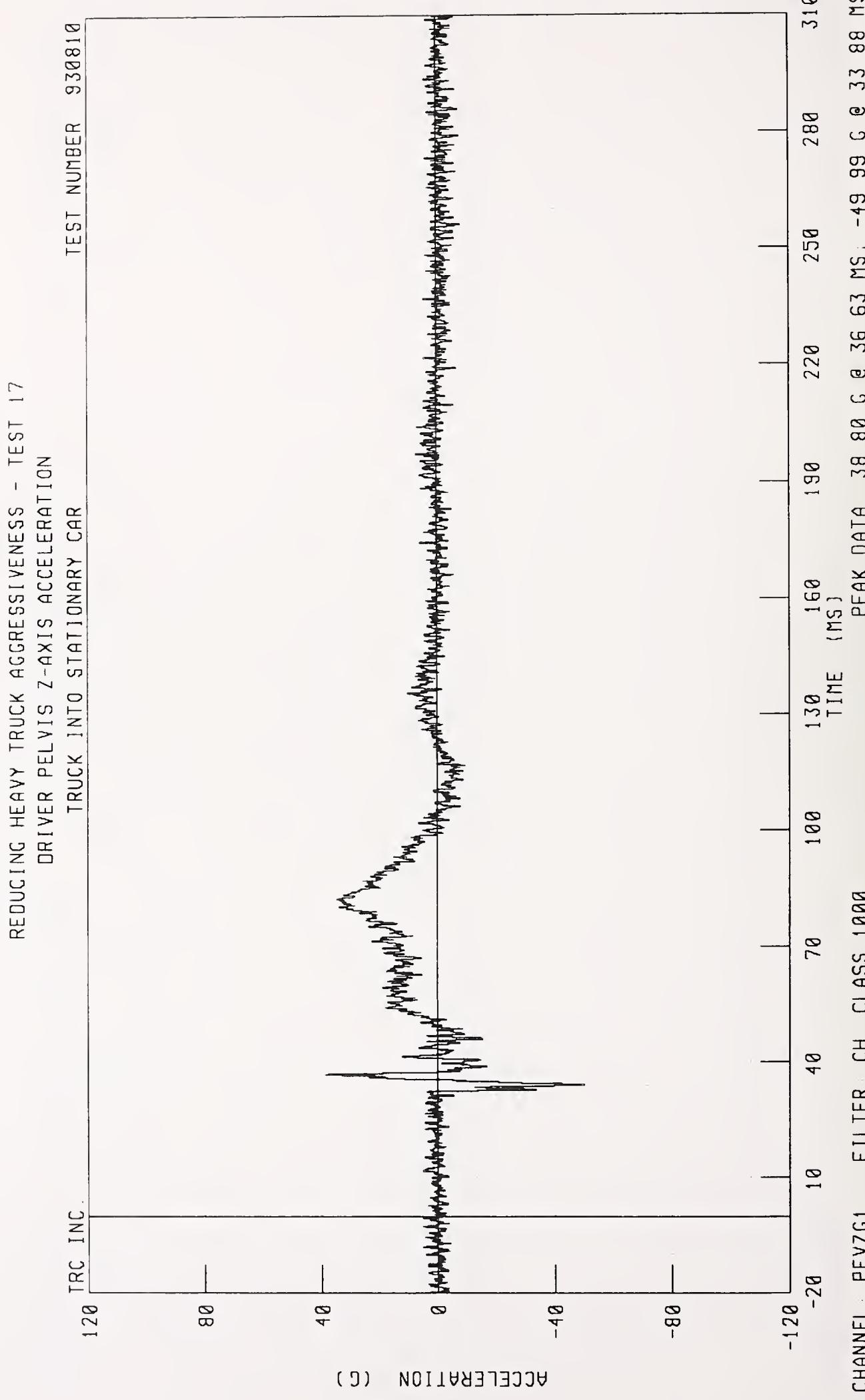
-80

-120

ACCELERATION (G)



CHANNEL PEVYG1 FILTER CH CLASS 1000
TIME (MS) PEAK DATA 38 93 G @ 32 88 MS, -42 72 G @ 73 38 MS
310 280 250 220 190 160 130 100 70 40 10 -20

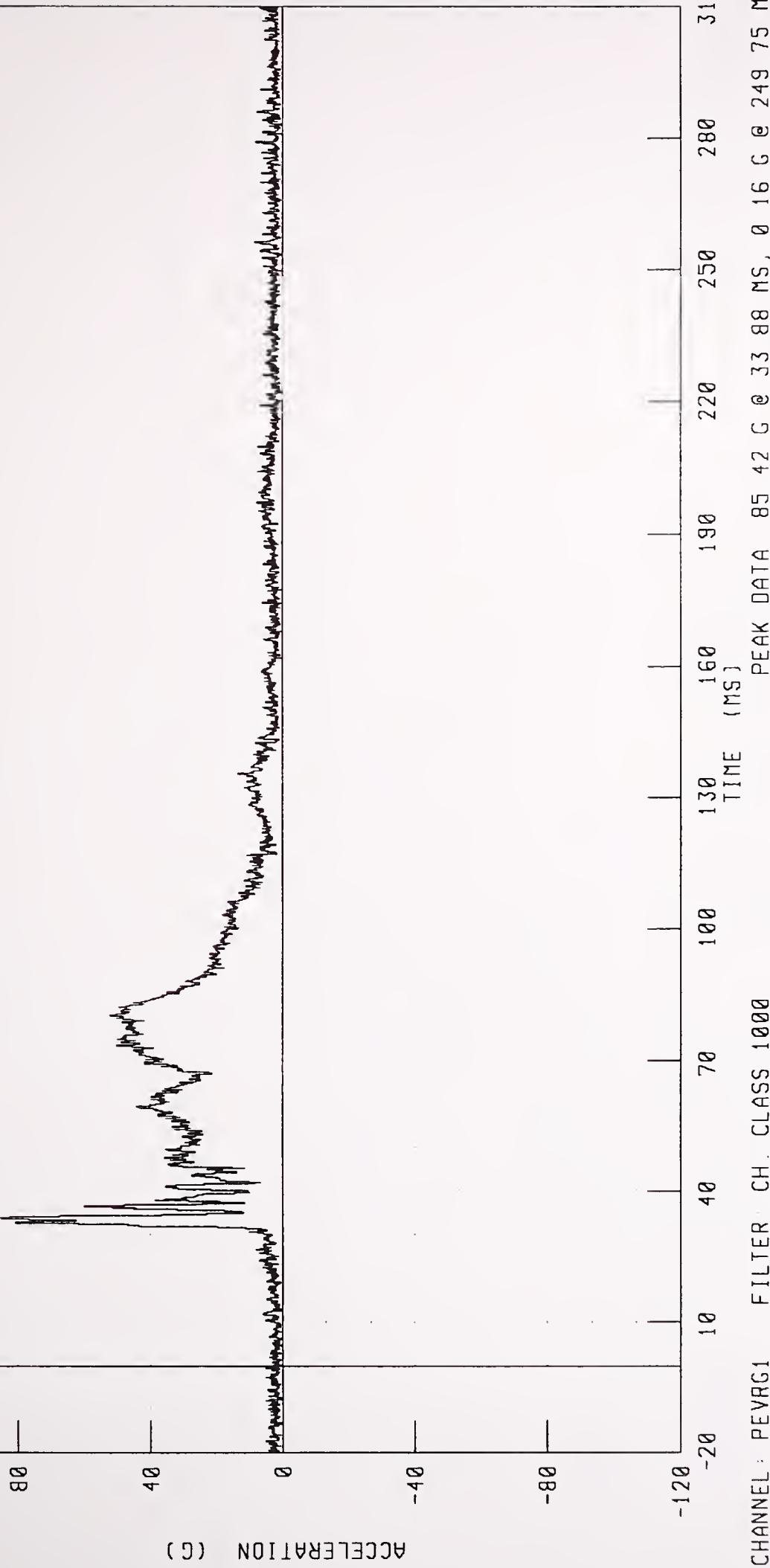


REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER PELVIS RESULTANT ACCELERATION

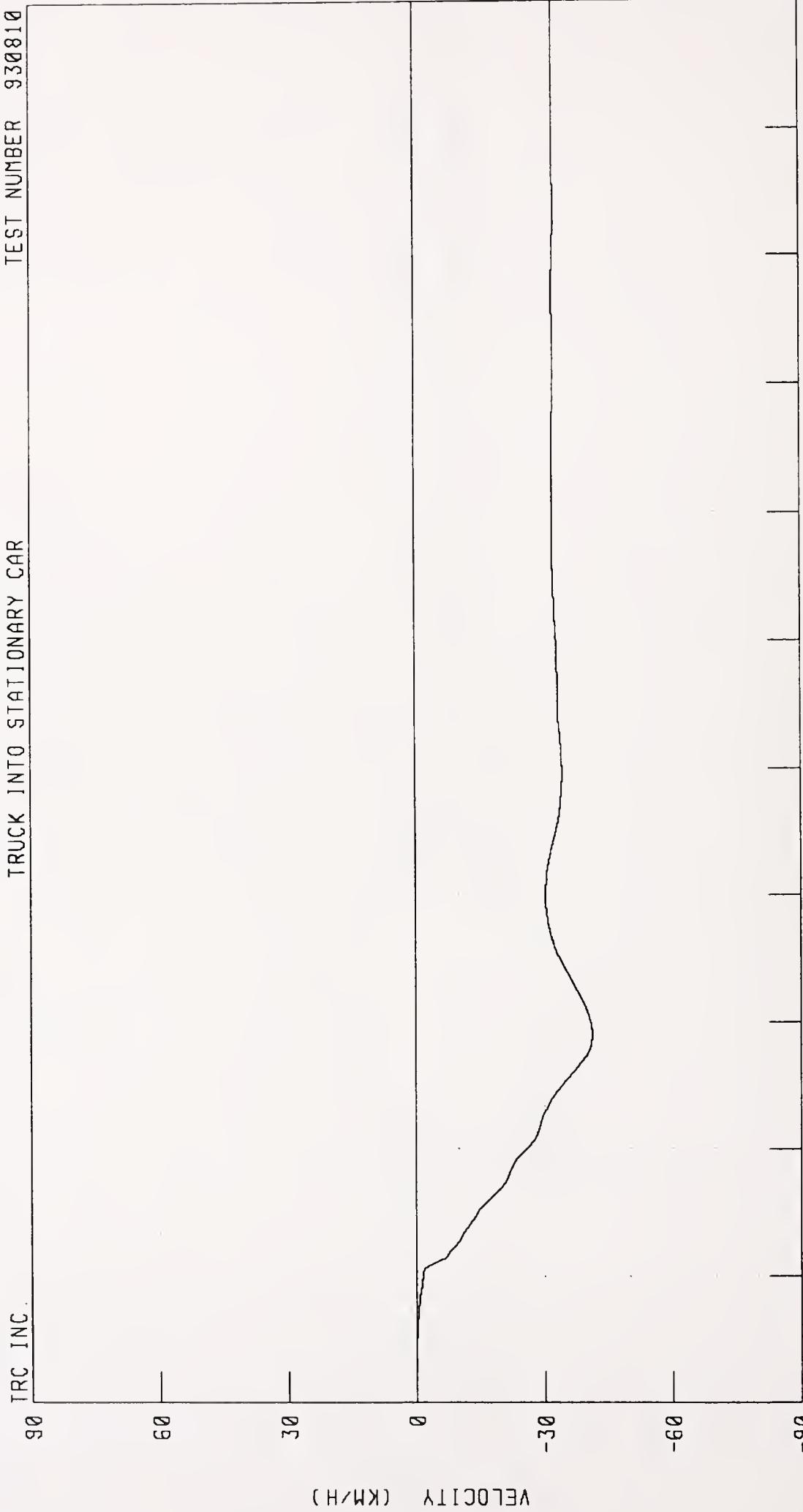
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

IRC INC



REDUCING HEAVY TRUCK AGGRESSION - TEST 17
DRIVER PELVIS X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR
TEST NUMBER 930810



CHANNEL: PEVX11 FILTER CH CLASS 180
TIME (MS) PEAK DATA 0 10 KM/H @ 975 MS, -41 07 KM/H @ 8725 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER PELVIS Y-AXIS VELOCITY

TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

90

60

30

0

-30

-60

-90

VELOCITY (KM/H)

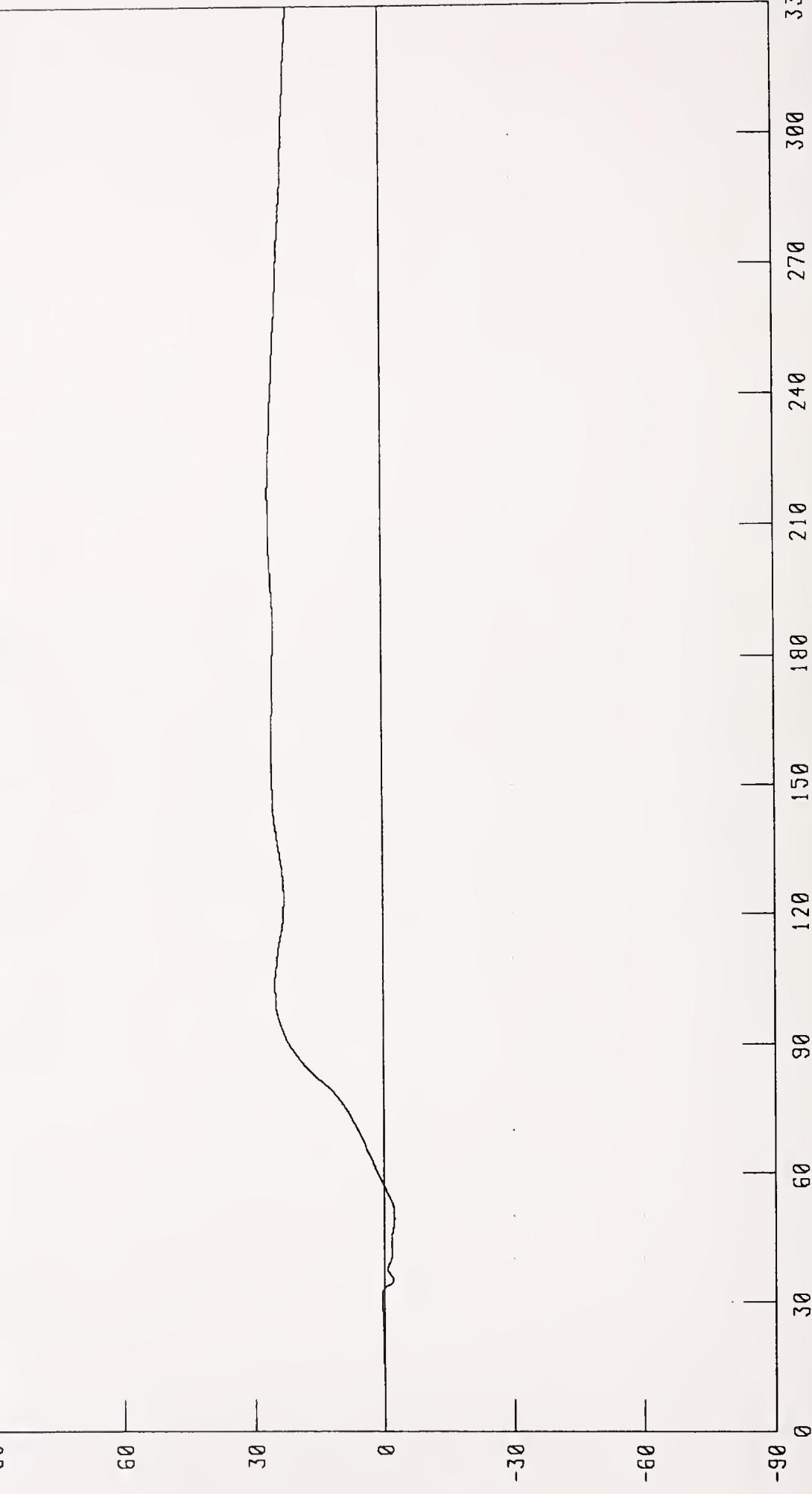
0 30 60 90 120 150 180
TIME (MS) 210 240 270 300 330

CHANNEL PEVYV1 FILTER CH CLASS 180

PEAK DATA 1 64 KM/H @ 40 25 MS, -46 42 KM/H @ 330 00 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
DRIVER PELVIS Z-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810
TRC INC

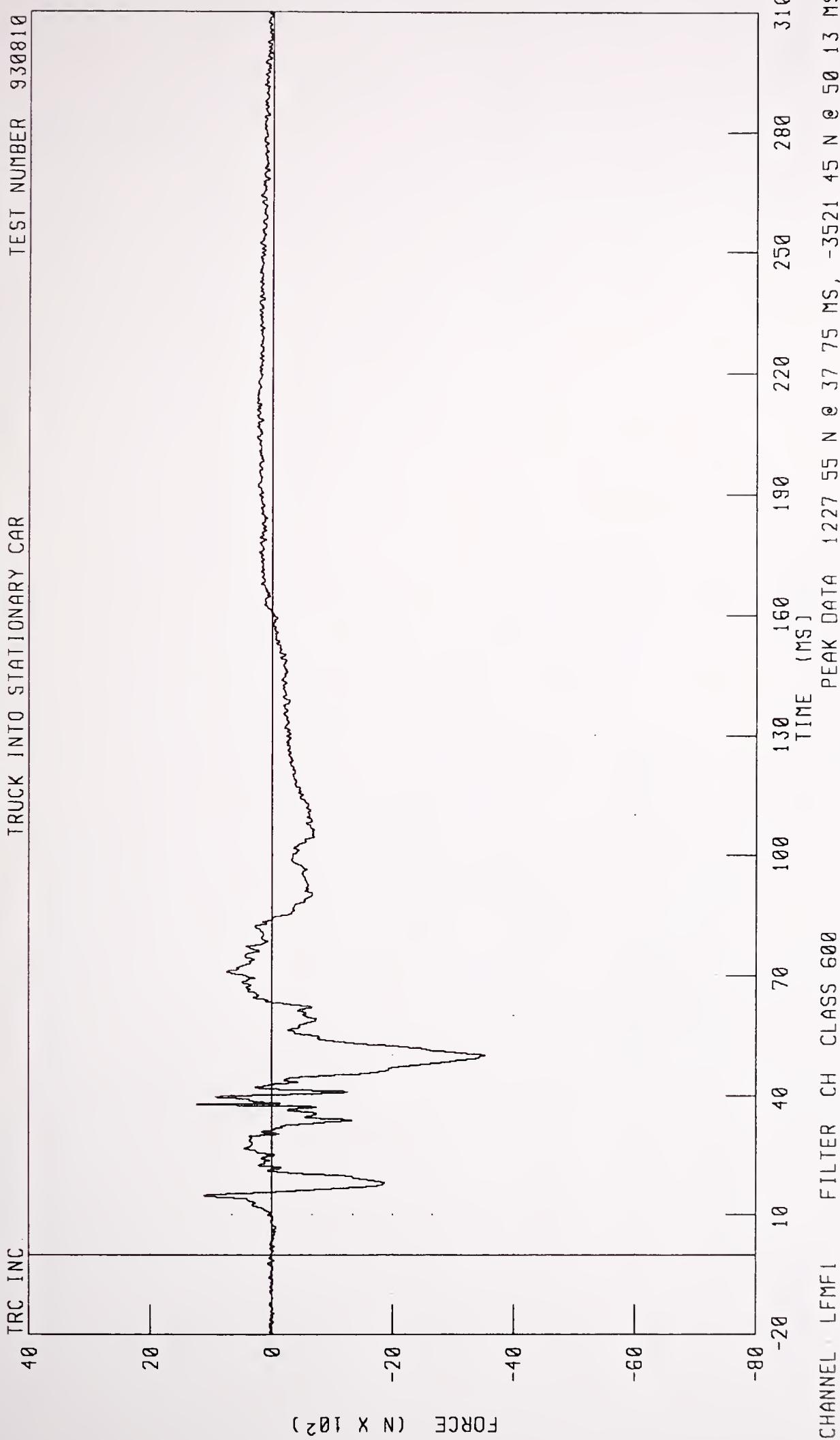


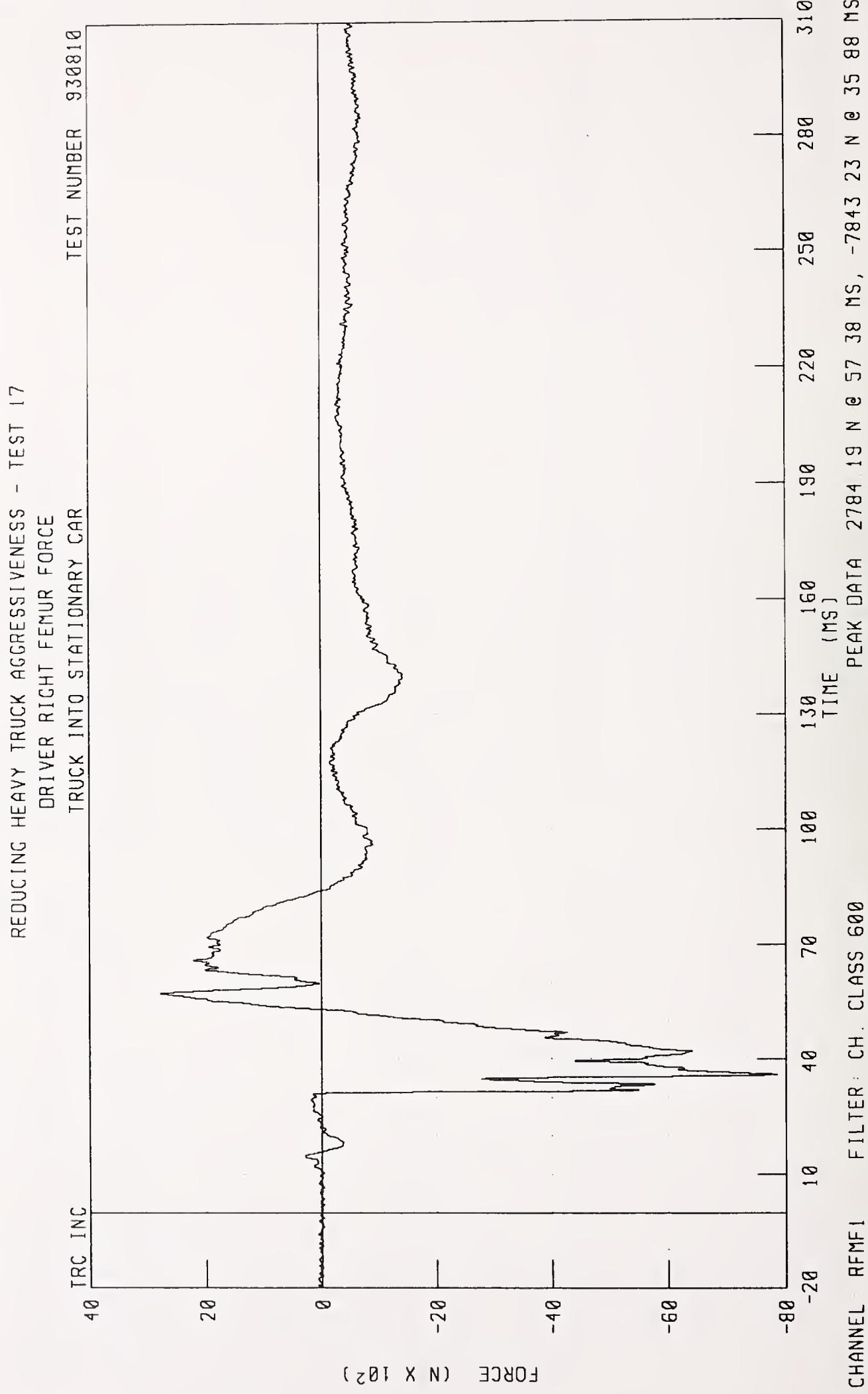
CHANNEL PEVZV1 FILTER CH CLASS 180
PEAK DATA 26 33 KM/H @ 218 38 MS, -2 40 KM/H @ 49 38 MS

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17

DRIVER LEFT FEMUR FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

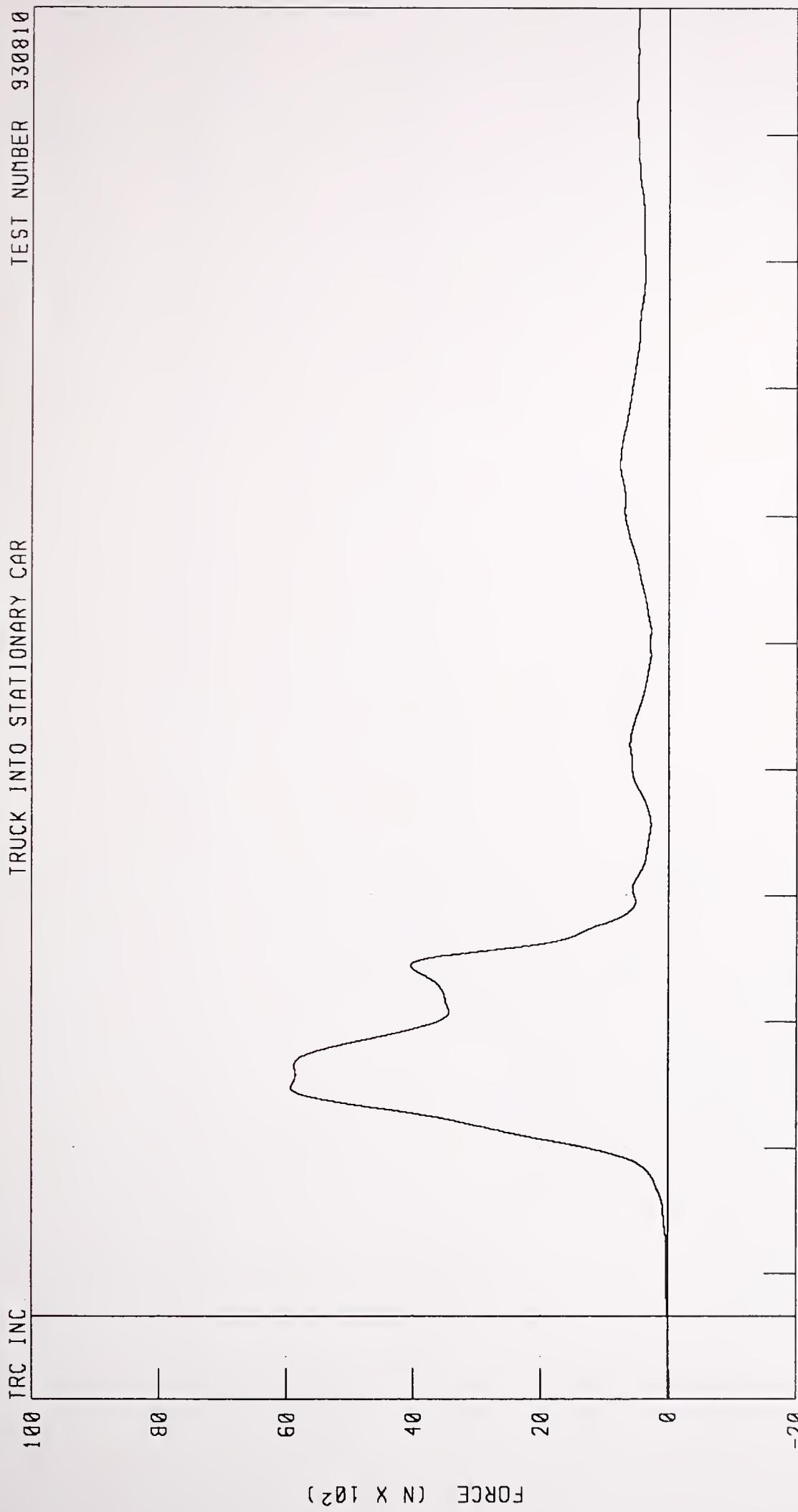




REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

DRIVER LAP BELT OUTBOARD FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

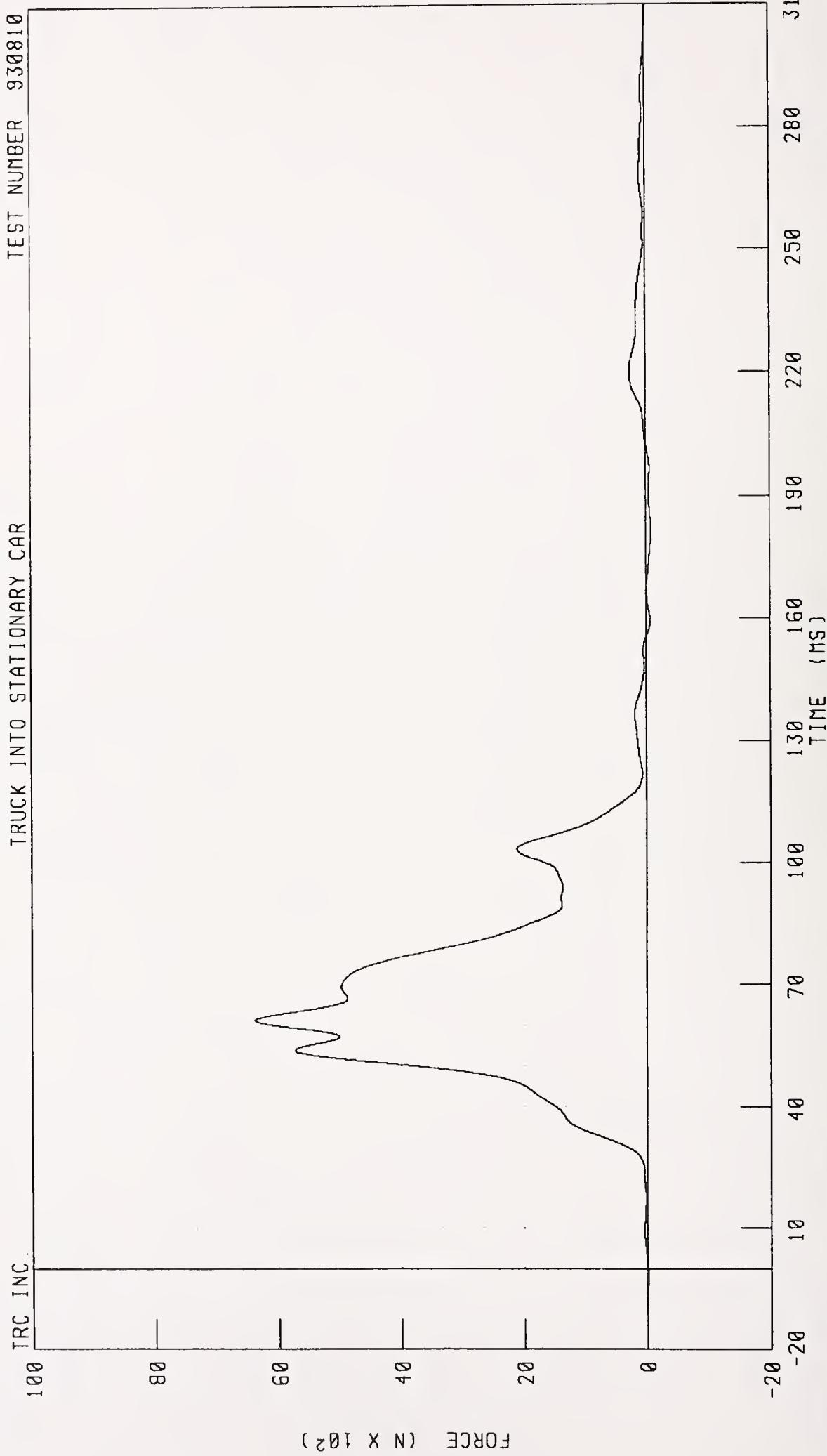


CHANNEL LB0F1 FILTER CH CLASS 60
PEAK DATA 5927 49 N @ 54 38 MS, -15 98 N @ -17 38 MS

REDUCING HEAVY TRUCK AGGRESSION - TEST 17

DRIVER SHOULDER BELT FORCE
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810



CHANNEL SHBF1 FILTER CH. CLASS 60

PEAK DATA 6381 54 N @ 61 25 MS, -81 79 N @ 181 88 MS

REDUCING HEAVY TRUCK AGGRESSION - TEST 17
LEFT REAR SEAT X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

40

20

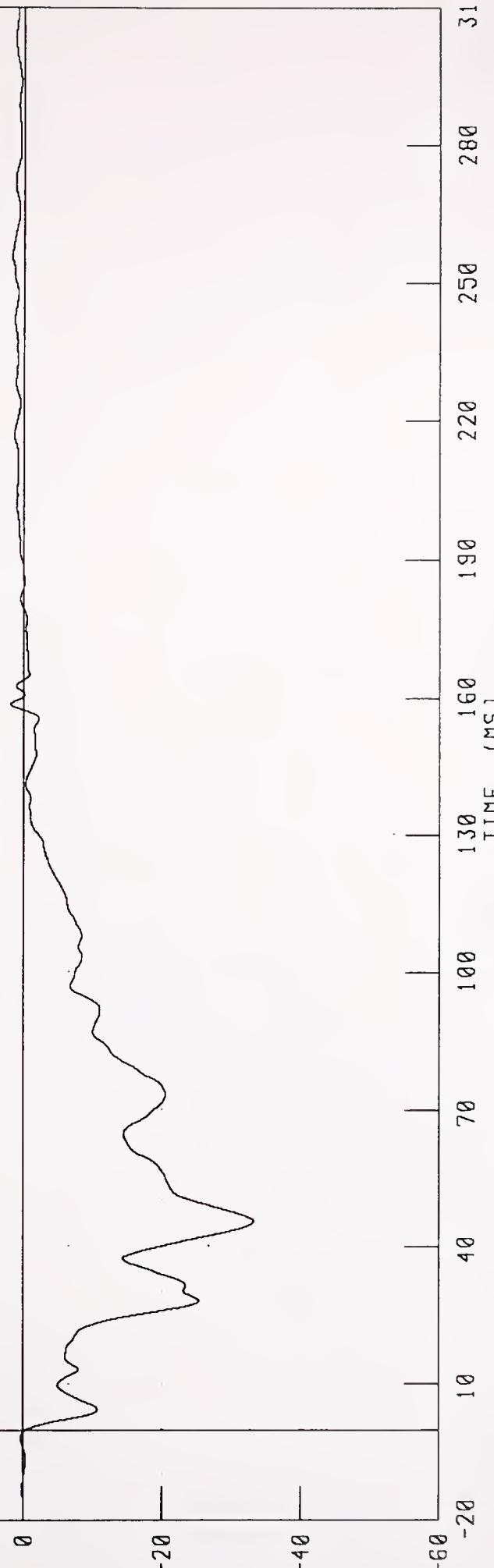
0

-20

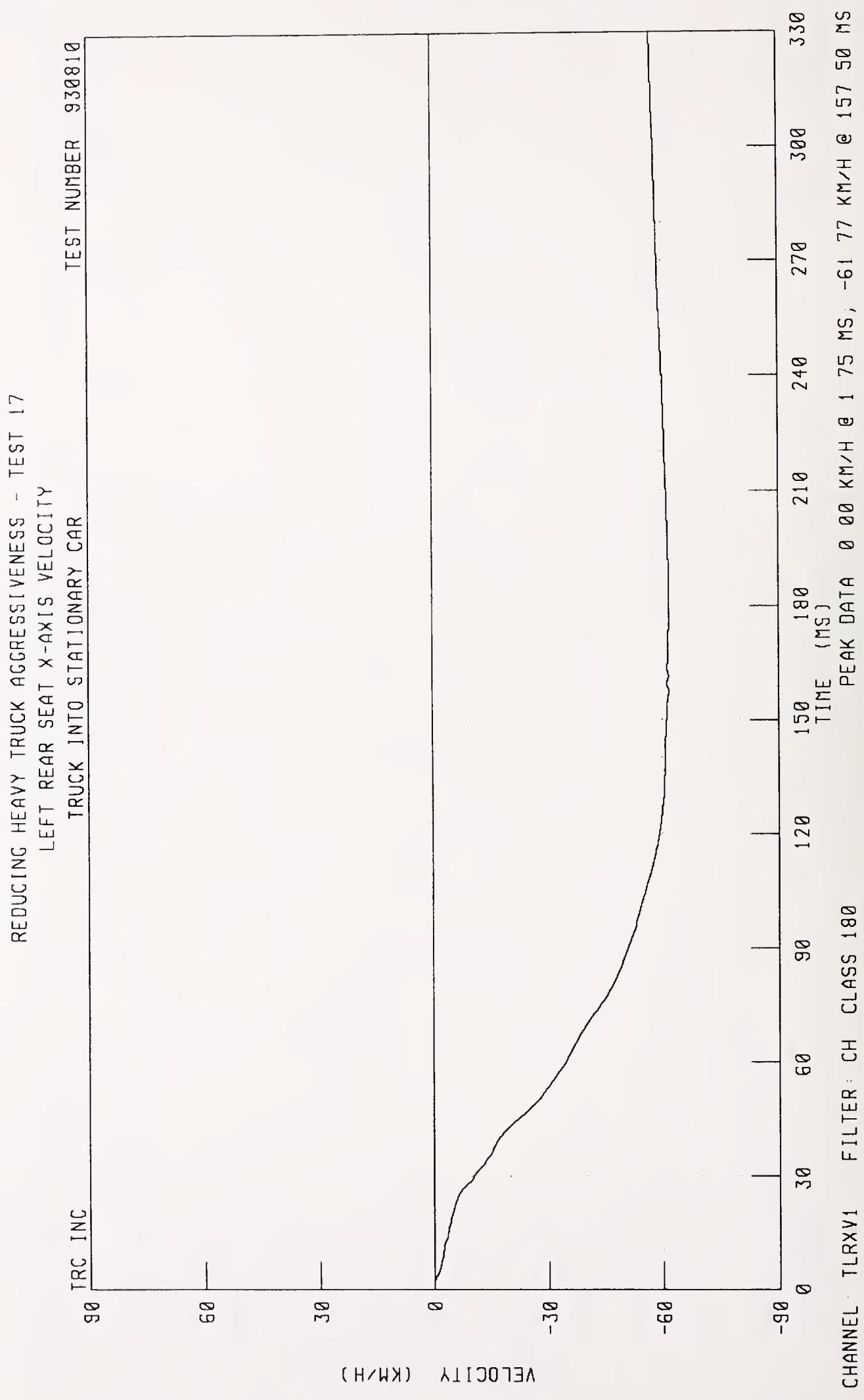
-40

-60

ACCELERATION (G)



CHANNEL TLRXG1 FILTER CH. CLASS 60 PEAK DATA 1 83 G @ 158 63 MS, -33 15 G @ 45 50 MS



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
RIGHT REAR SEAT X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

60

40

20

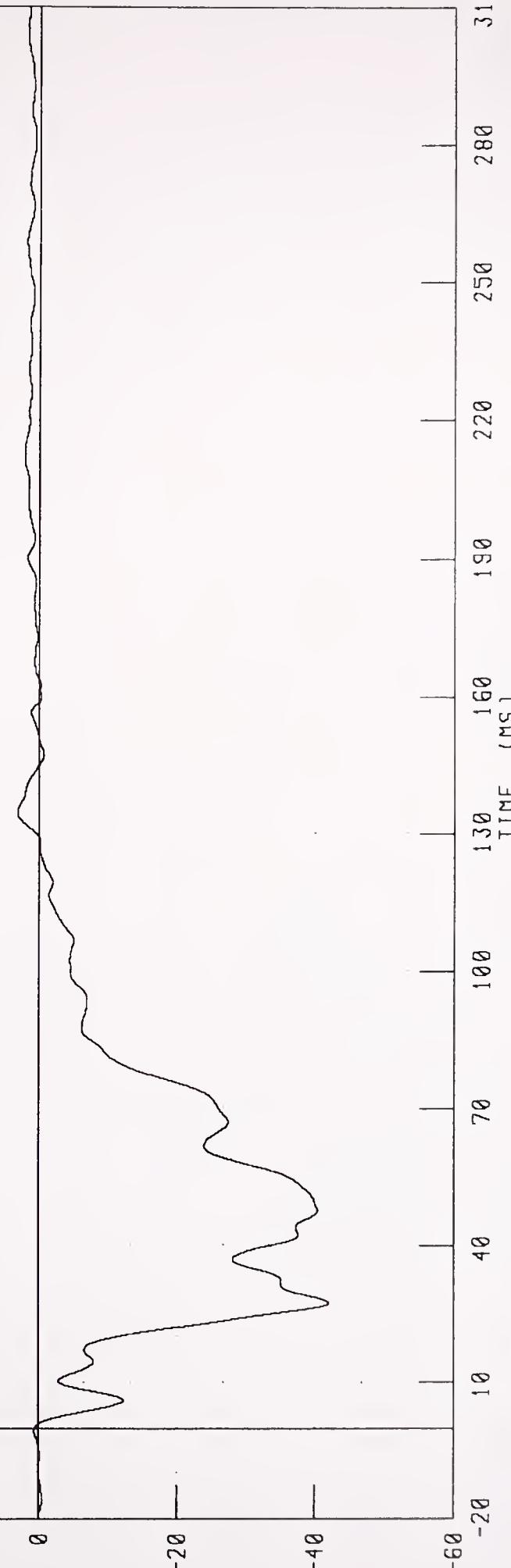
0

-20

-40

-60

ACCELERATION (G)

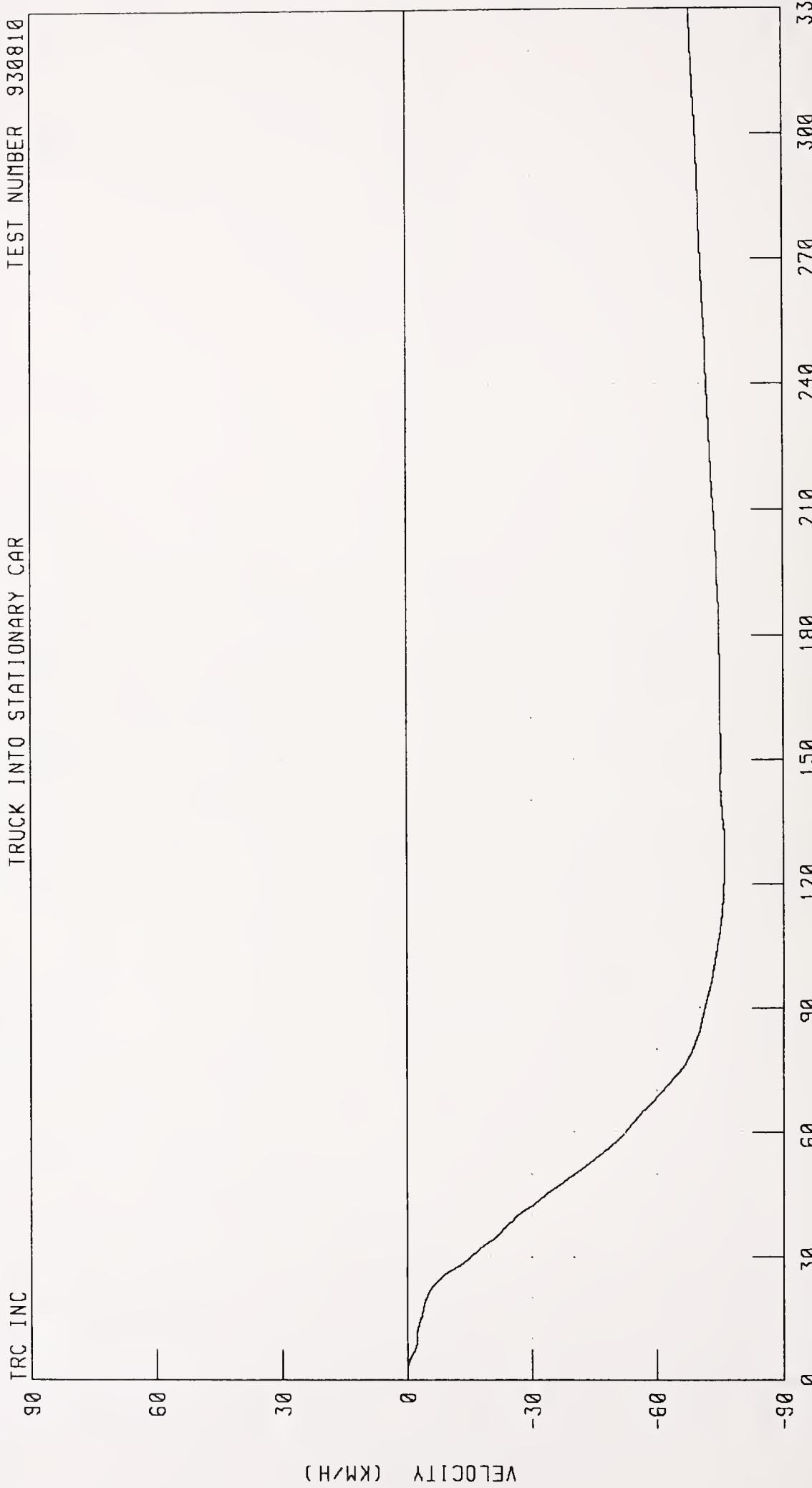


CHANNEL TRRXG1 FILTER CH CLASS 60

PEAK DATA 3 10 G @ 134 38 MS, -41 97 G @ 27 50 MS

TIME (MS) 130 160 190 220 250 280 310

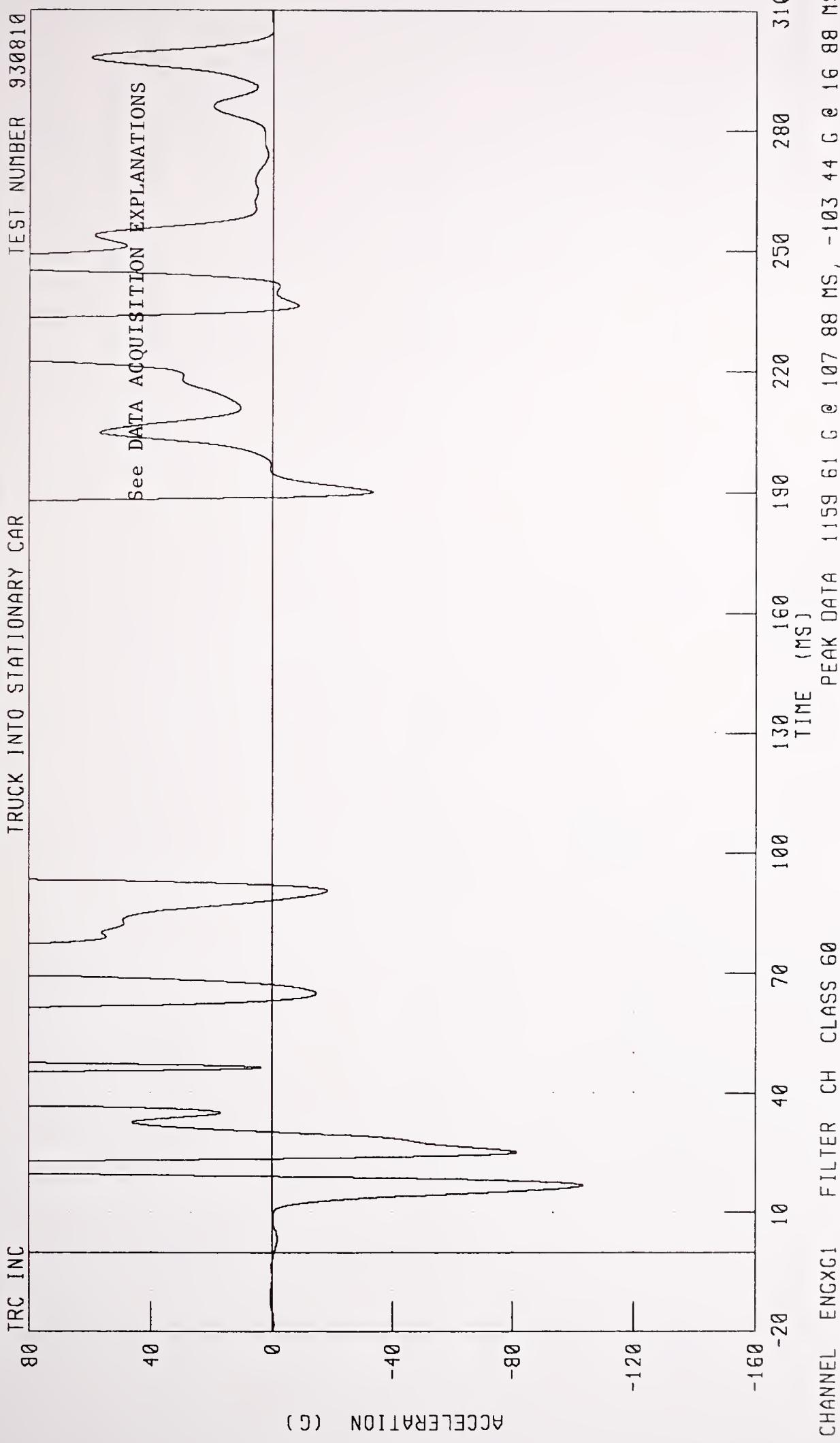
REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
RIGHT REAR SEAT X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR
TEST NUMBER 930810



CHANNEL: TRRXV1 FILTER CH CLASS 180
PEAK DATA 0 02 KM/H @ 2 25 MS, -76 01 KM/H @ 130 13 MS

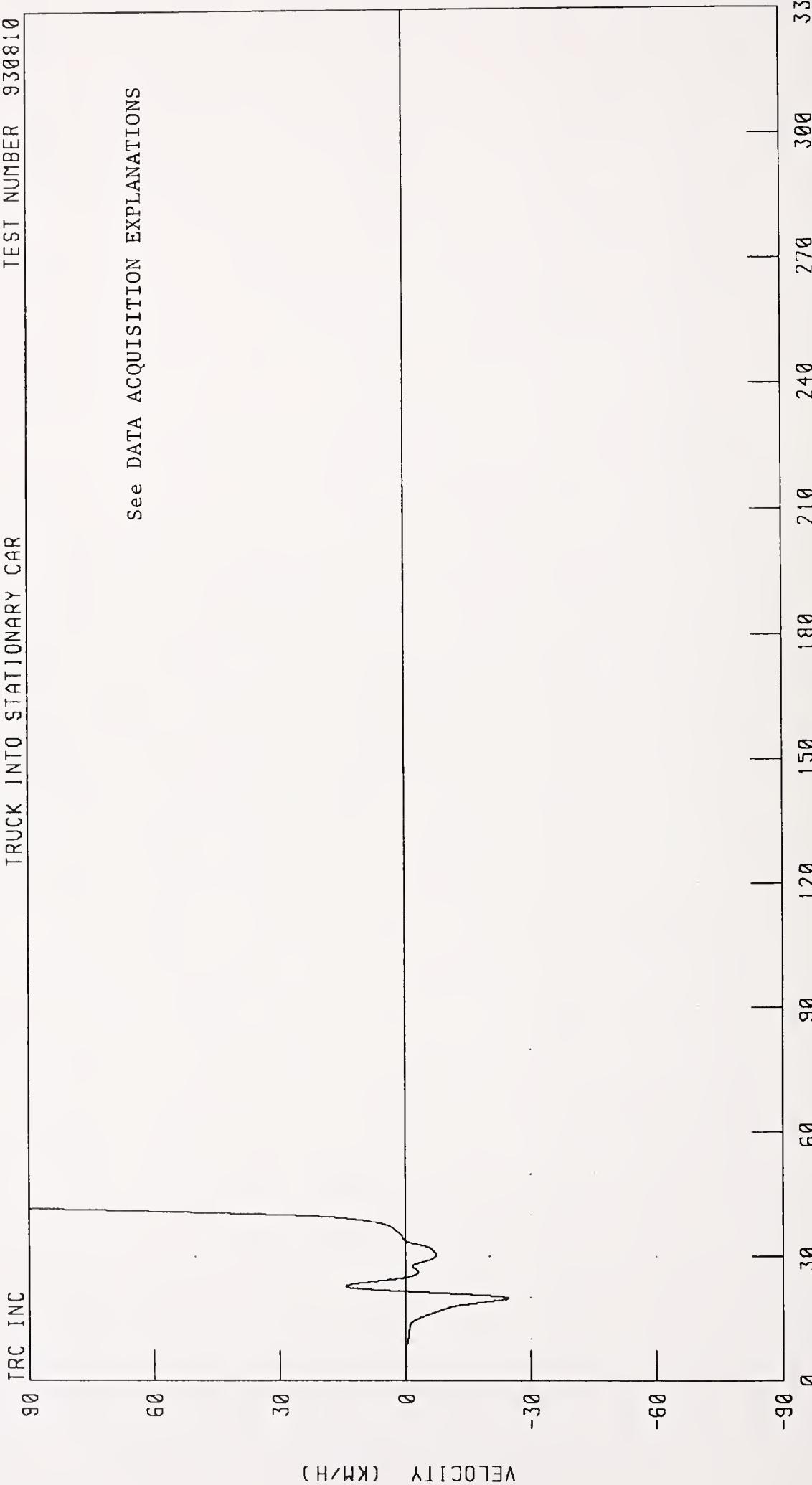
REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

ENGINE TOP X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSION - TEST 17
ENGINE TOP X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR
TEST NUMBER 930810

See DATA ACQUISITION EXPLANATIONS



CHANNEL : ENGX1 FILTER CH. CLASS 180
PEAK DATA 3343 41 KM/H @ 330 00 MS, -24 73 KM/H @ 19 88 MS

TIME (MS)

VELOCITY (KM/H)

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17

ENGINE BOTTOM X-AXIS ACCELERATION

TRUCK INTO STATIONARY CAR

TEST NUMBER 930818

TBC INC

0

-50

-100

-150

-200

-250

ACCELERATION (G)

-20

10

40

70

100

130

160

190

220

250

280

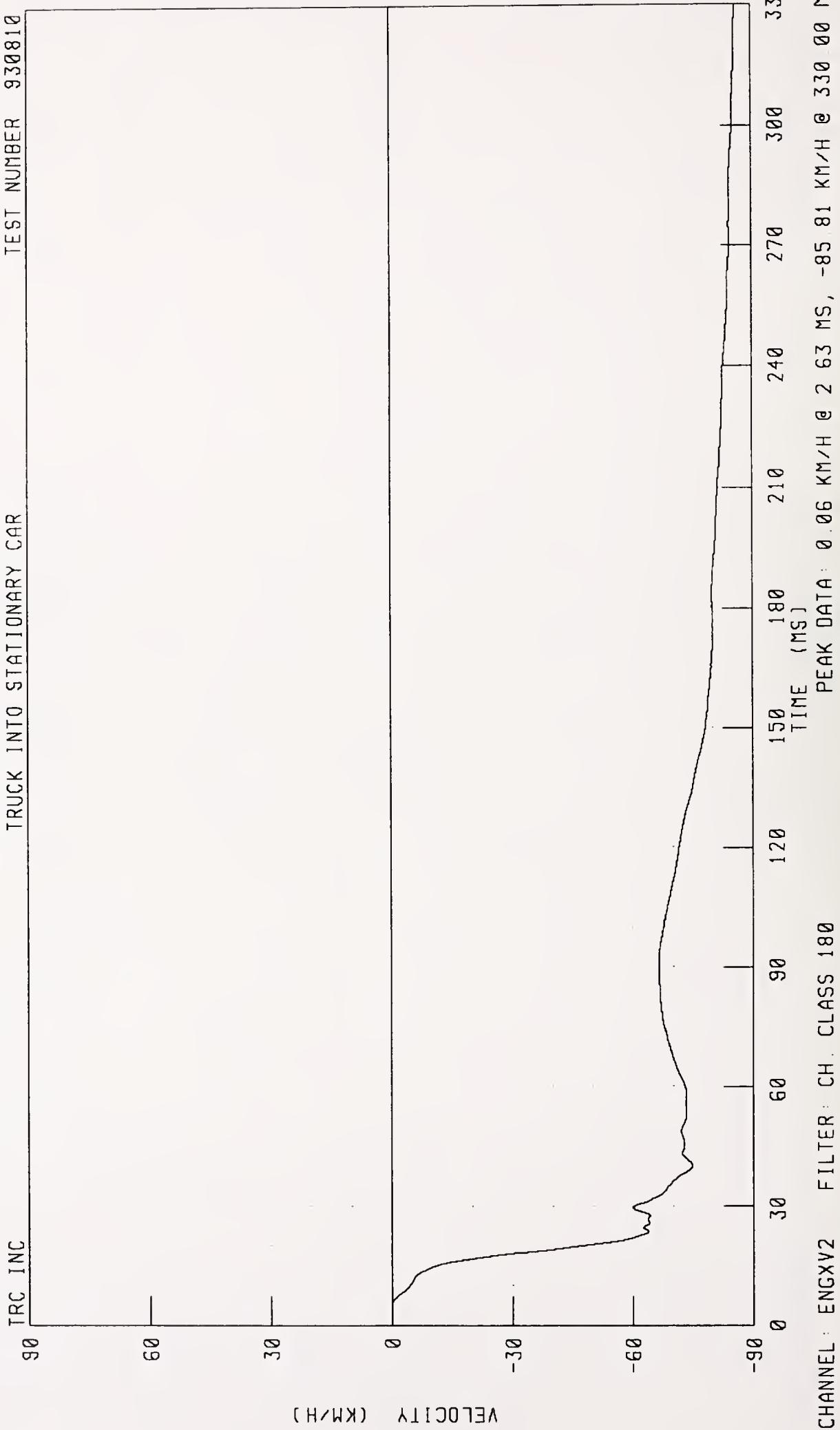
310

CHANNEL : ENGXG2 FILTER : CH CLASS 60

PEAK DATA 22 49 G @ 28 00 MS, -232 80 G @ 18 75 MS

TIME (MS)

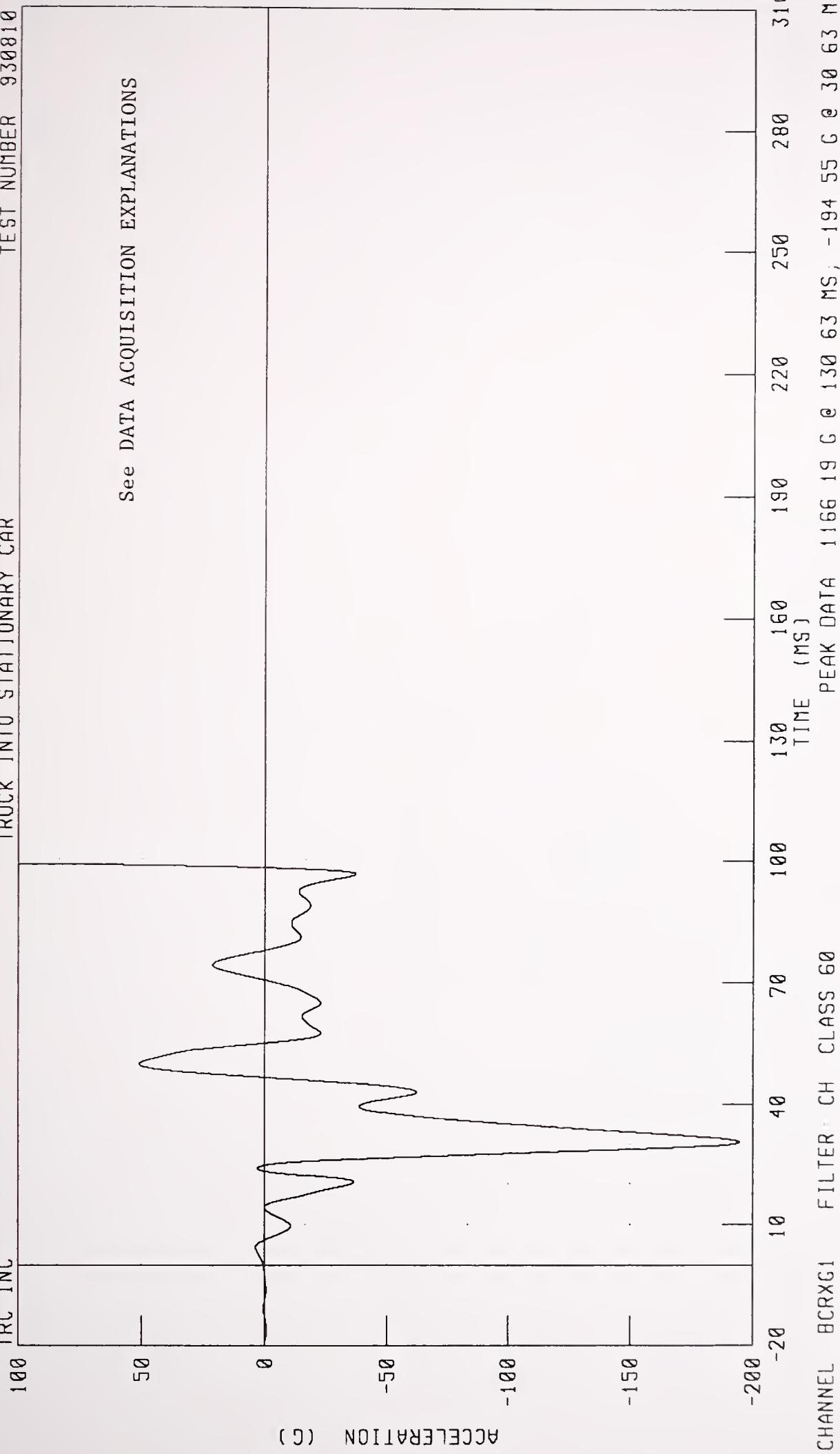
REDUCING HEAVY TRUCK AGGRESSION - TEST 17
ENGINE BOTTOM X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER 930810
TRUCK INTO STATIONARY CAR

See DATA ACQUISITION EXPLANATIONS

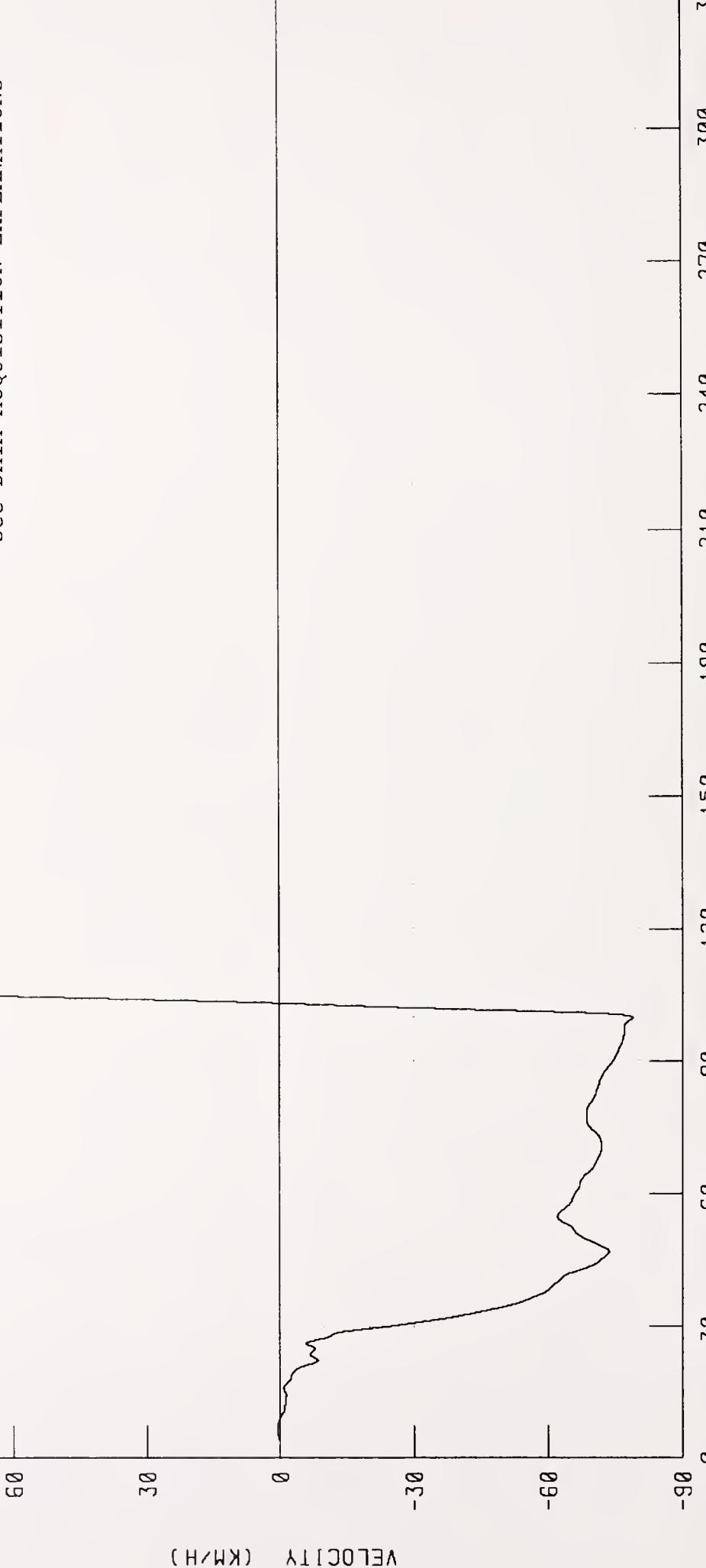


REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
RIGHT BRAKE CALIPER X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

See DATA ACQUISITION EXPLANATIONS

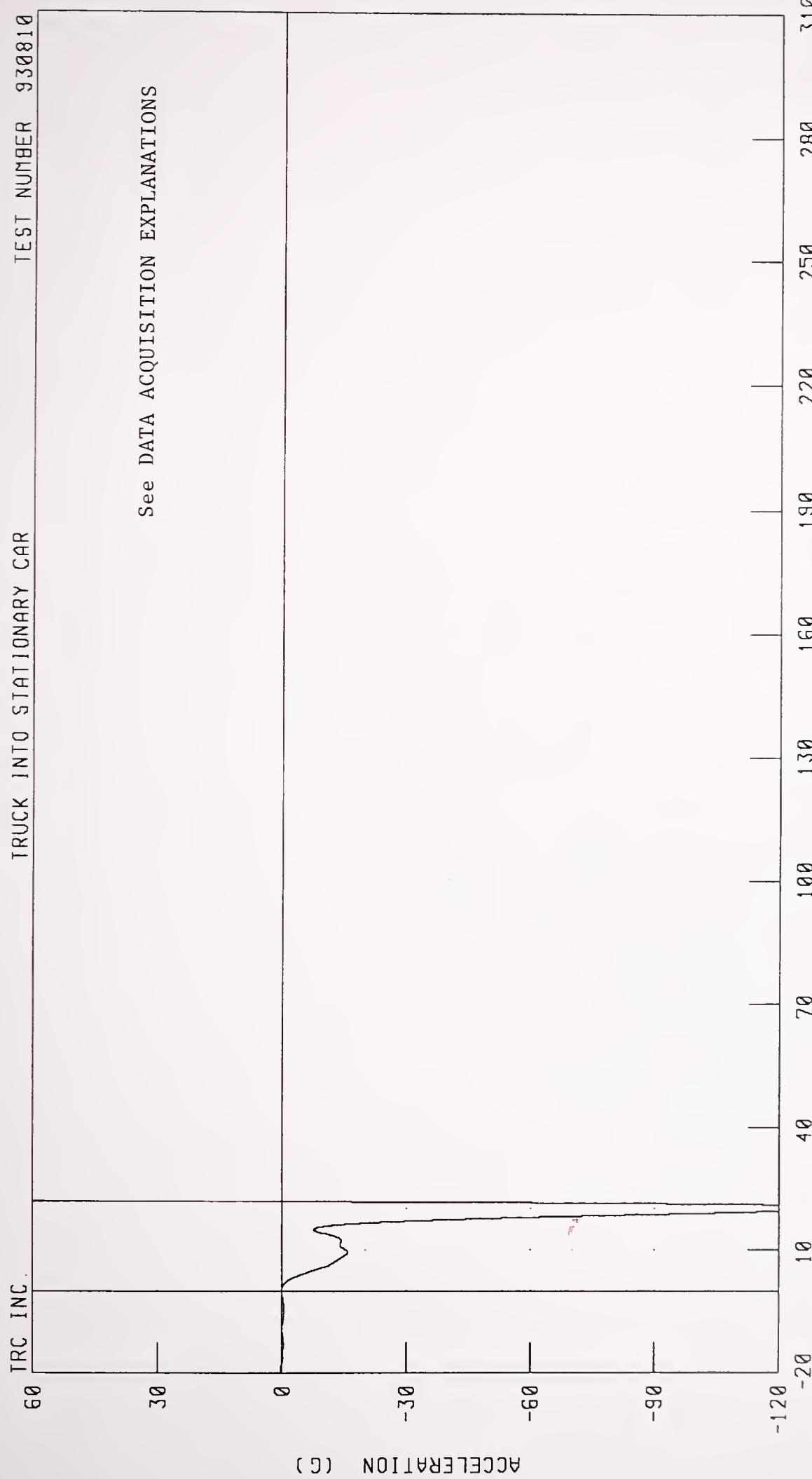


CHANNEL BCRXV1 FILTER CH CLASS 180
PEAK DATA 8960 66 KM/H @ 330 00 MS ; -78 85 KM/H @ 99 88 MS
TIME (MS) 0 30 60 90 120 150 180 210 240 270 300 330

REDUCING HEAVY TRUCK AGGRESSION - TEST 17
LEFT BRAKE CALIPER X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

See DATA ACQUISITION EXPLANATIONS



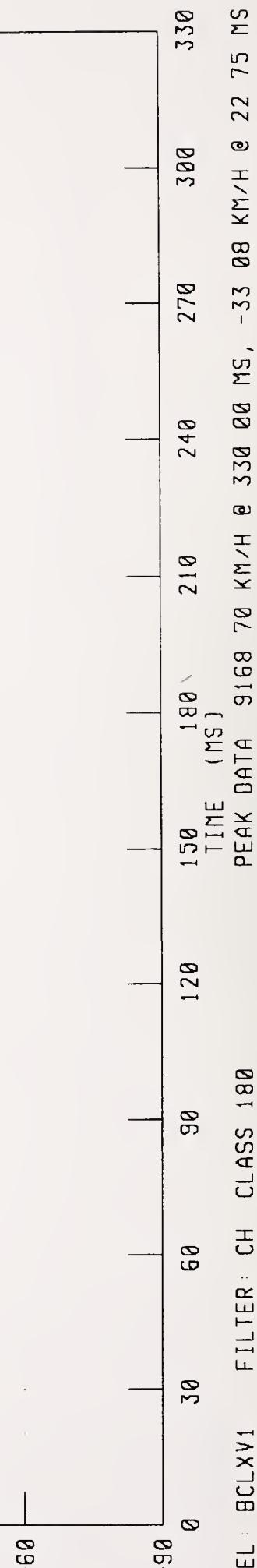
REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
LEFT BRAKE CALIPER X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

See DATA ACQUISITION EXPLANATIONS

VELOCITY (KM/H)



CHANNEL: BCLXV1 FILTER: CH CLASS 180

PEAK DATA 9168 70 KM/H @ 330 00 MS, -33 08 KM/H @ 22 75 MS

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

See DATA ACQUISITION EXPLANATIONS

ACCELERATION (G)

0

-50

-100

-150

-200

310

280

250

220

190

160

130

100

70

40

10

-20

-50

TIME (MS)

PEAK DATA

CHANNEL

FILTER

CH CLASS

60

38 20 G @ 7 88 MS

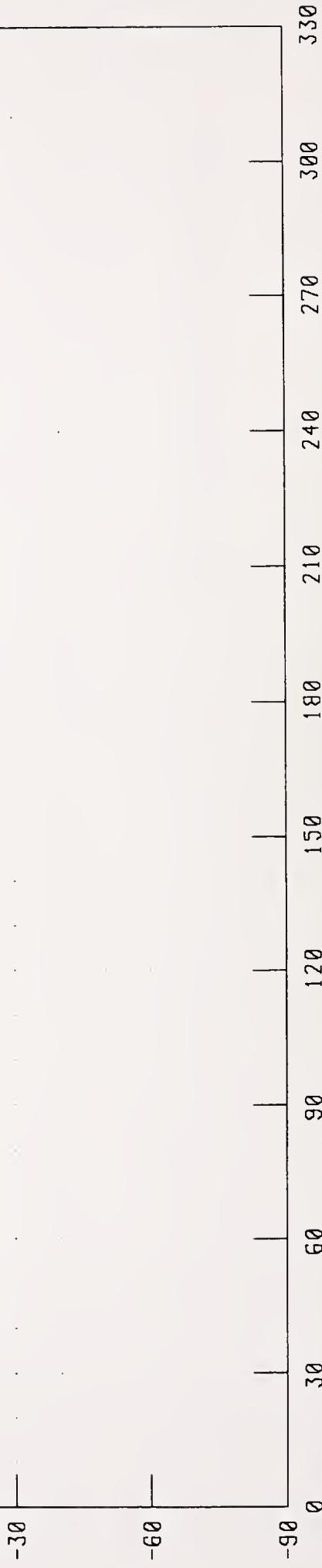
REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
INSTRUMENT PANEL CENTER X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

See DATA ACQUISITION EXPLANATIONS

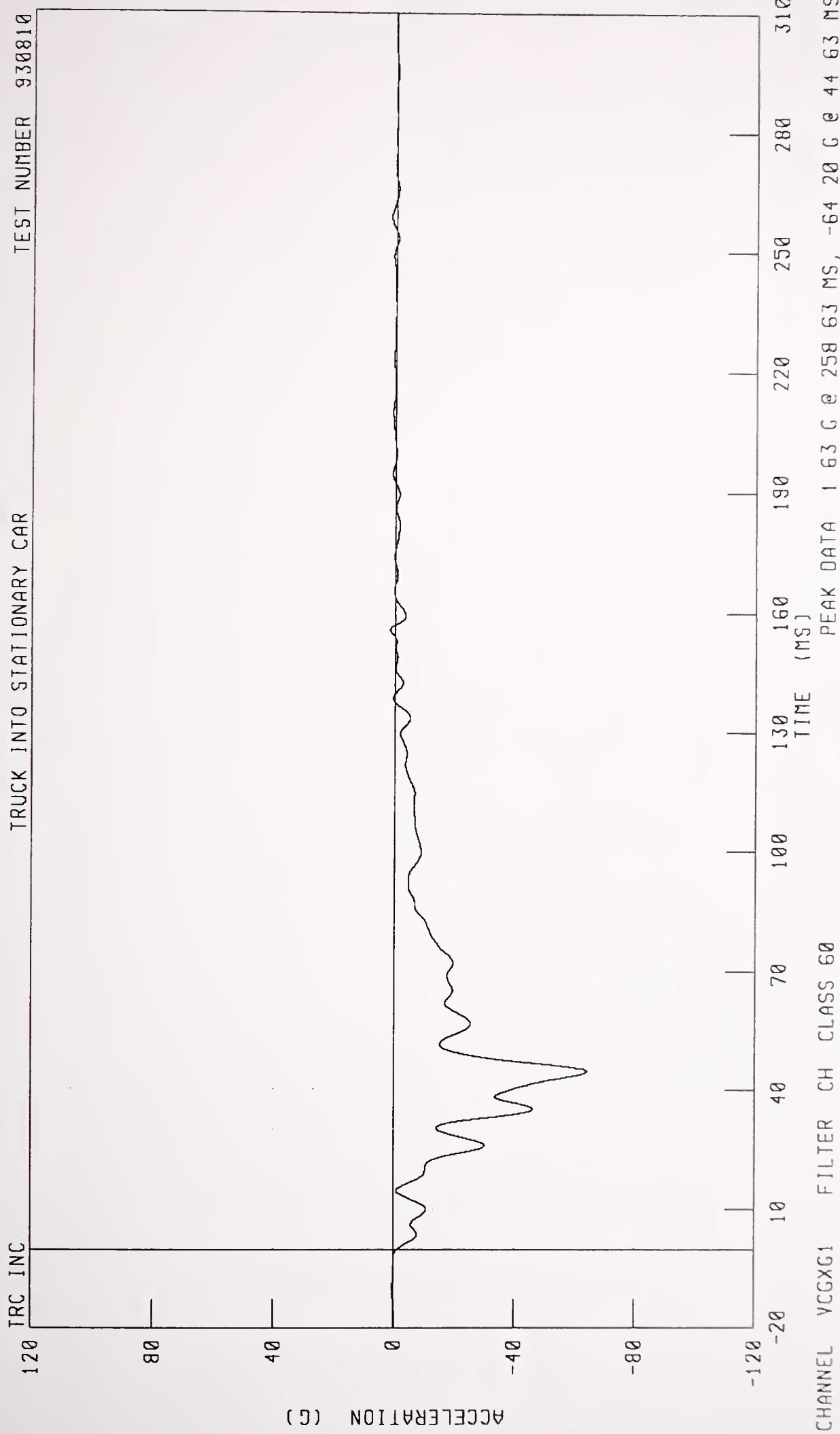
VELOCITY (KM/H)

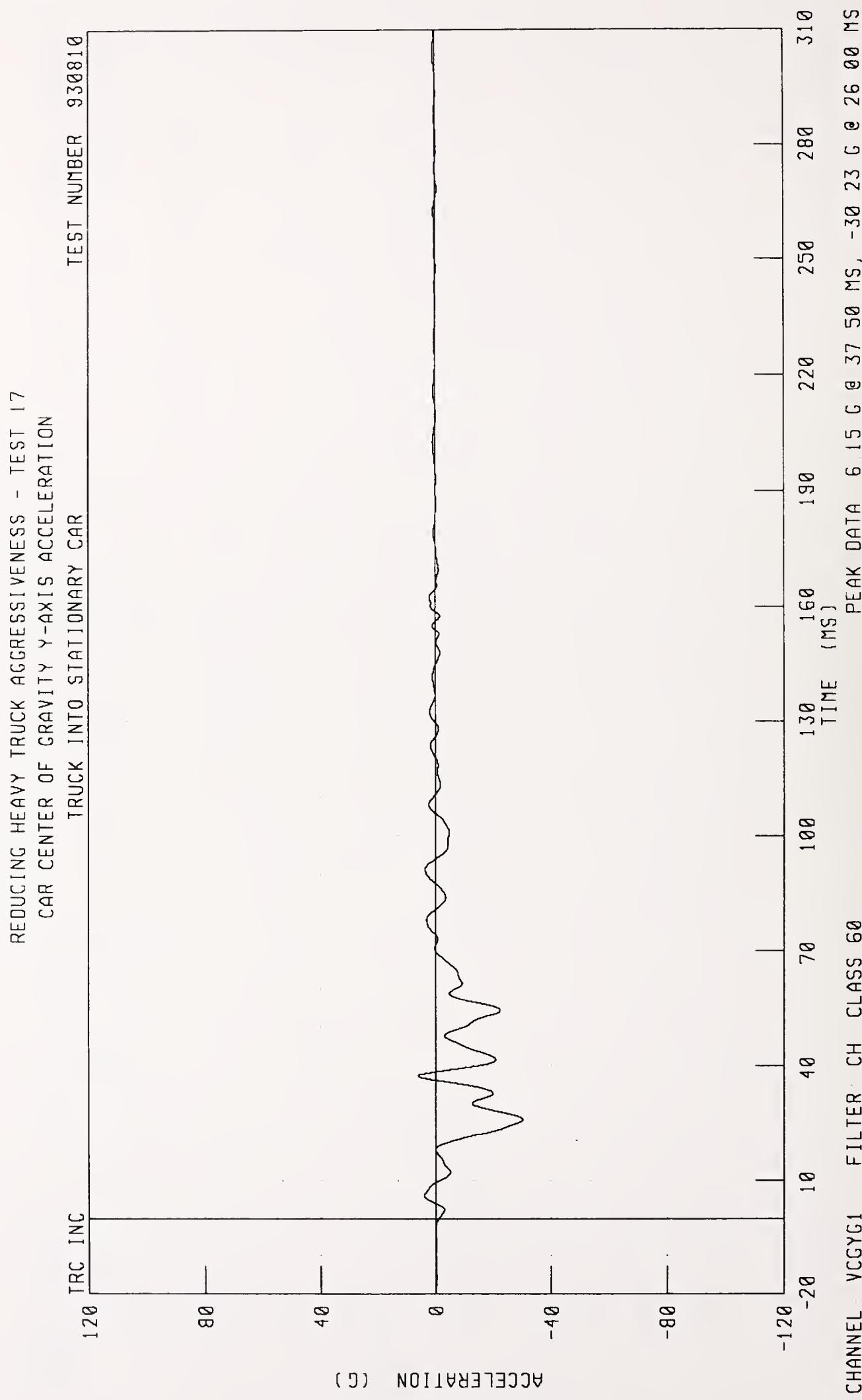


CHANNEL DPCXVI FILTER CH CLASS 180 TIME (MS)
PEAK DATA 4196 15 KM/H @ 330 00 MS, -9 67 KM/H @ 29 13 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
CAR CENTER OF GRAVITY X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

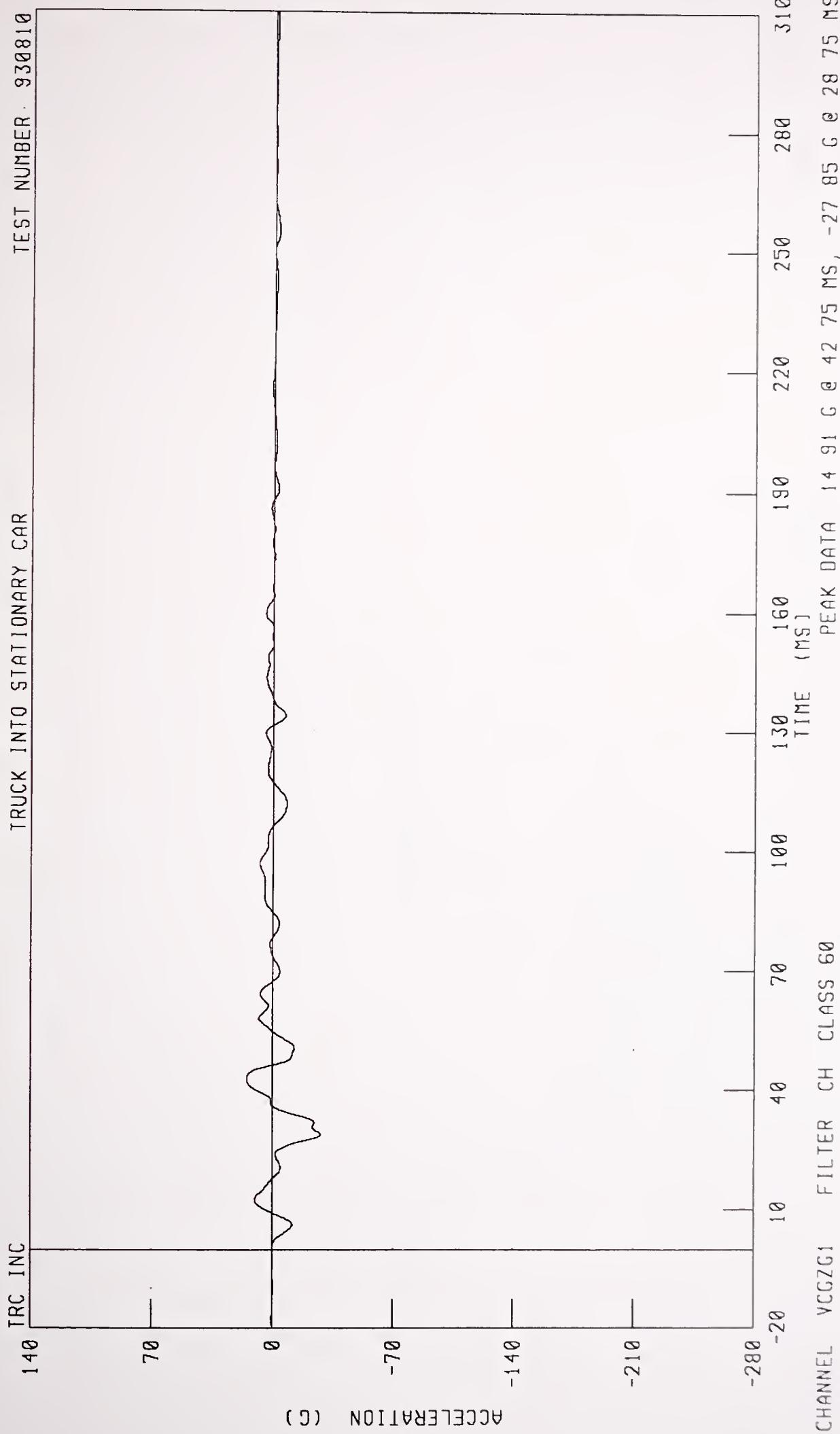
TEST NUMBER 930810





REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
CAR CENTER OF GRAVITY Z-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER . 930810



REDUCING HEAVY TRUCK AGGRESSION - TEST 17
CAR CENTER OF GRAVITY RESULTANT ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

-200

0

400

800

1200

1600

2000

2400

ACCELERATION (G)

100

70

40

10

-20

0

40

70

100

130

160

190

220

250

280

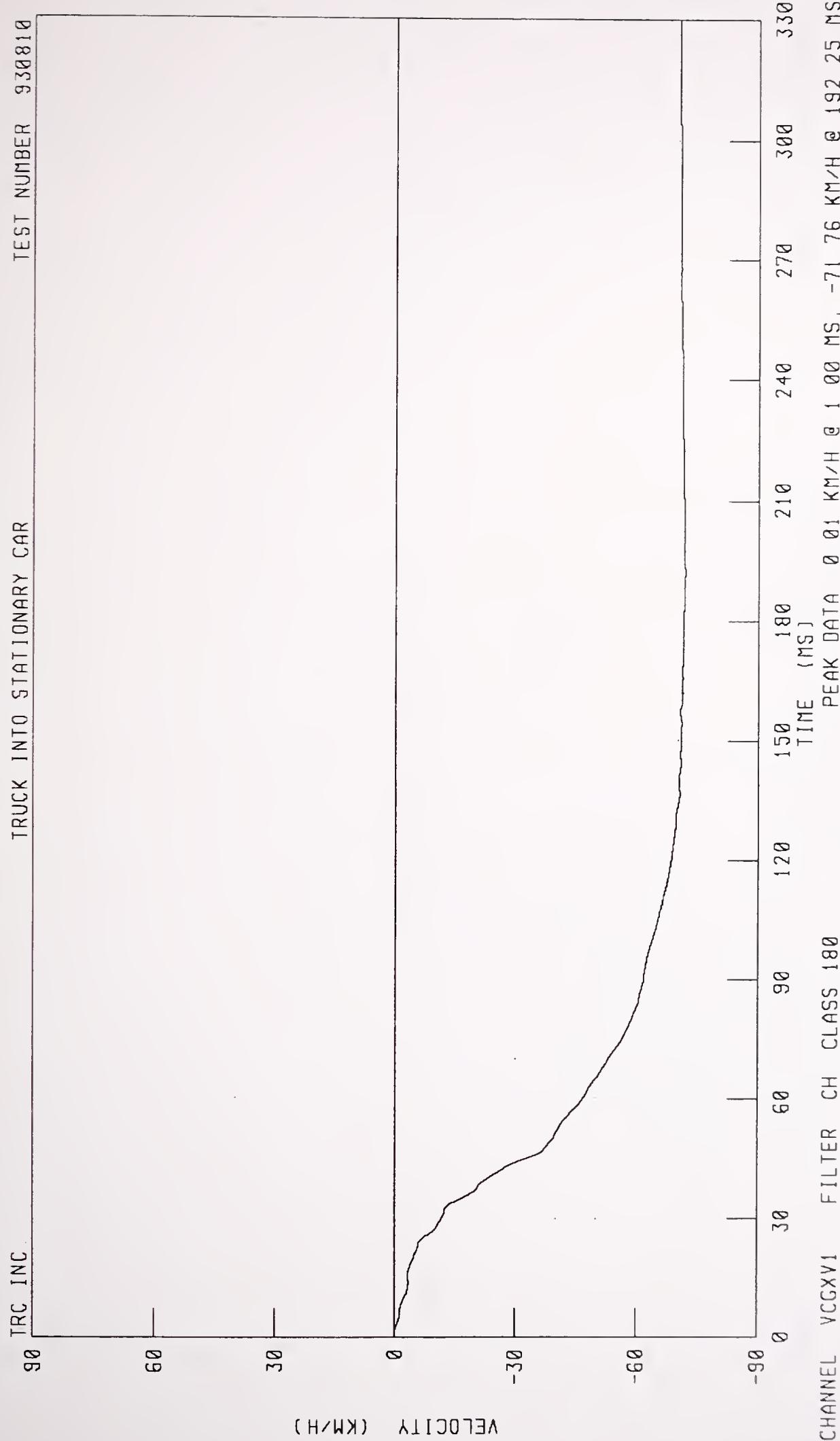
310

CHANNEL: VCGRG1 FILTER: CH CLASS 60

PEAK DATA 66 43 G @ 44 38 MS, 0 07 G @ -2 13 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
CAR CENTER OF GRAVITY X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
CAR CENTER OF GRAVITY Y-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

60

30

0

-30

-60

-90

VELOCITy (KM/H)

CHANNEL VCCYY1 FILTER: CH. CLASS 180

TIME (MS) PEAK DATA 0 36 KM/H @ 10.00 MS, -23.01 KM/H @ 106.00 MS

300 270 240 210 180

330 300 270

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
CAR CENTER OF GRAVITY Z-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

60

30

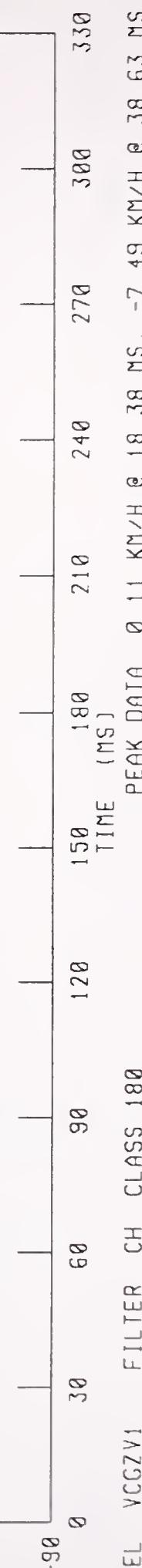
0

-30

-60

-90

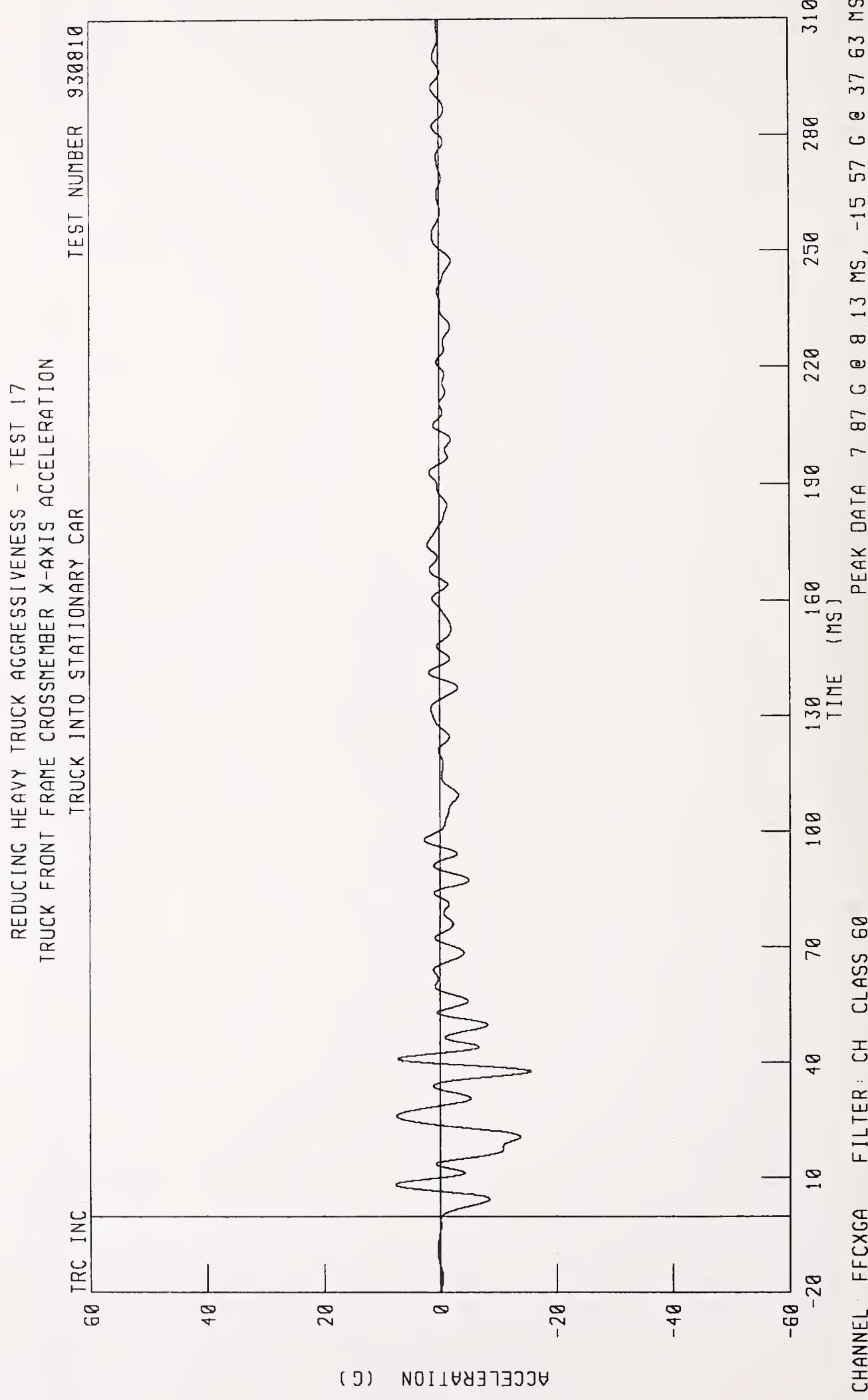
VELOCITY (KM/H)



CHANNEL VCGZV1 FILTER CH CLASS 180

PEAK DATA 0 11 KM/H @ 18 38 MS, -7 49 KM/H @ 38 63 MS

TIME (MS)



REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS ACCELERATION

TEST NUMBER 930810

TRUCK INTO STATIONARY CAR

TRC INC.

40

20

0

-20

-40

-60

ACCELERATION (G)

CHANNEL FFCYGA FILTER CH CLASS 60

PEAK DATA 15 20 G @ 47 88 MS, -18 14 G @ 29 88 MS

TIME

250

220

190

160

130

100

70

40

10

0

130

100

70

40

10

80

50

20

0

-10

-40

-70

-100

-130

-160

-190

-220

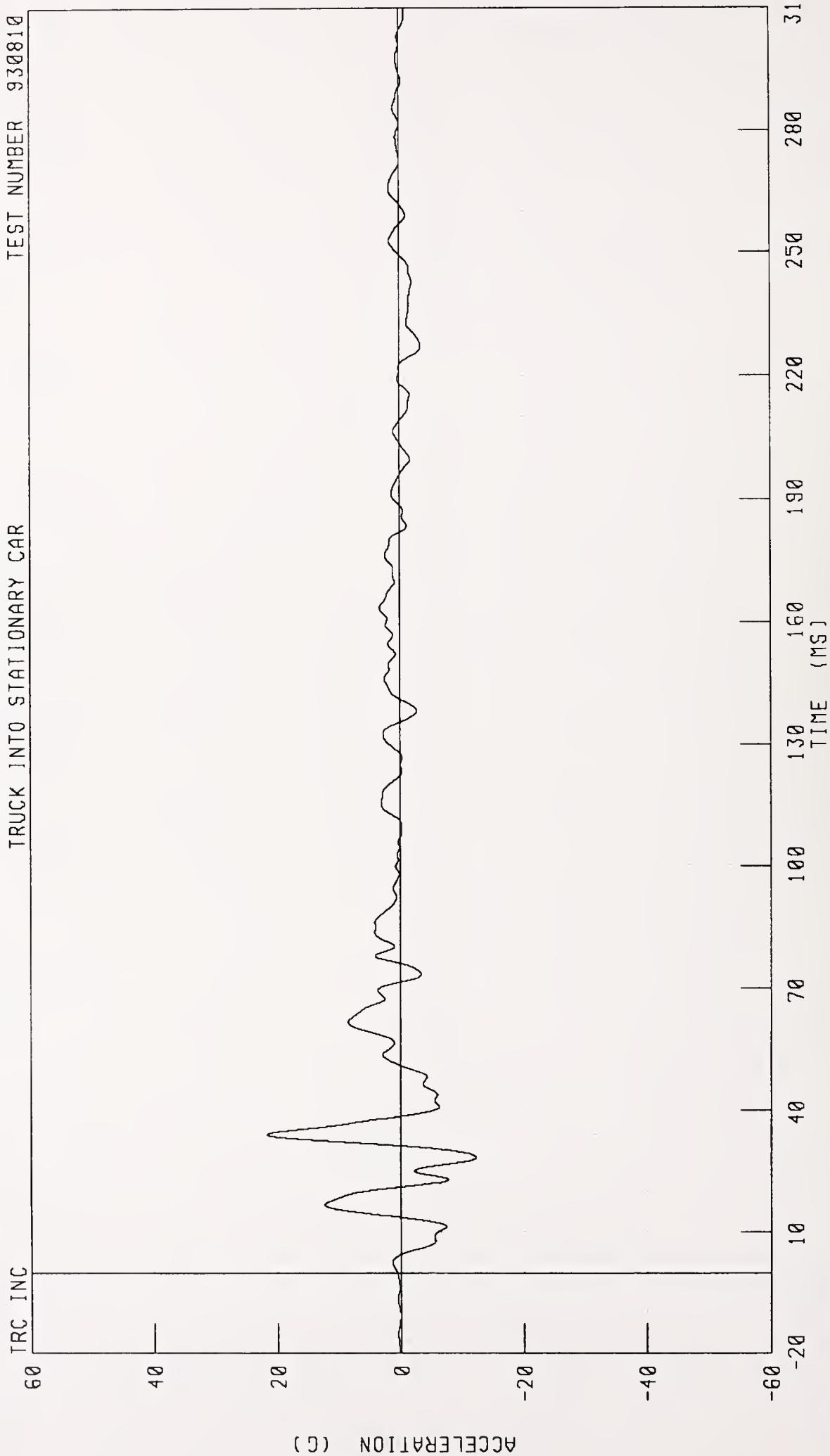
-250

-280

-310

REDUCING HEAVY TRUCK AGGRESSION - TEST 17 TRUCK FRONT FRAME CROSSMEMBER Z-AXIS ACCELERATION TRUCK INTO STATIONARY CAR

TEST NUMBER 938818



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
TRUCK FRONT FRAME CROSSMEMBER RESULTANT ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

63

46

30

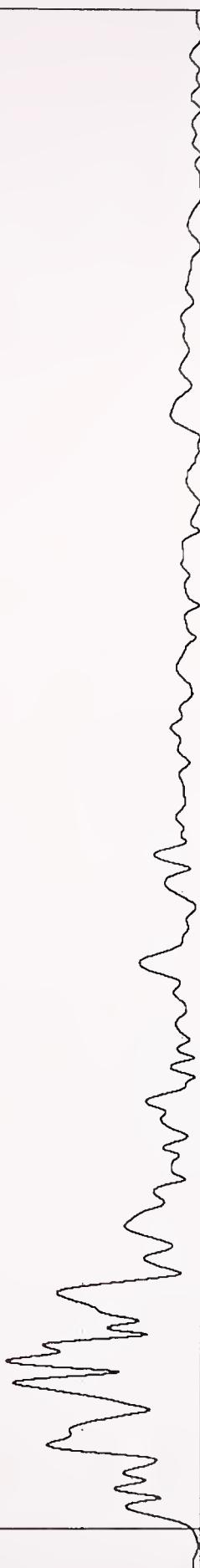
13

-3

-20

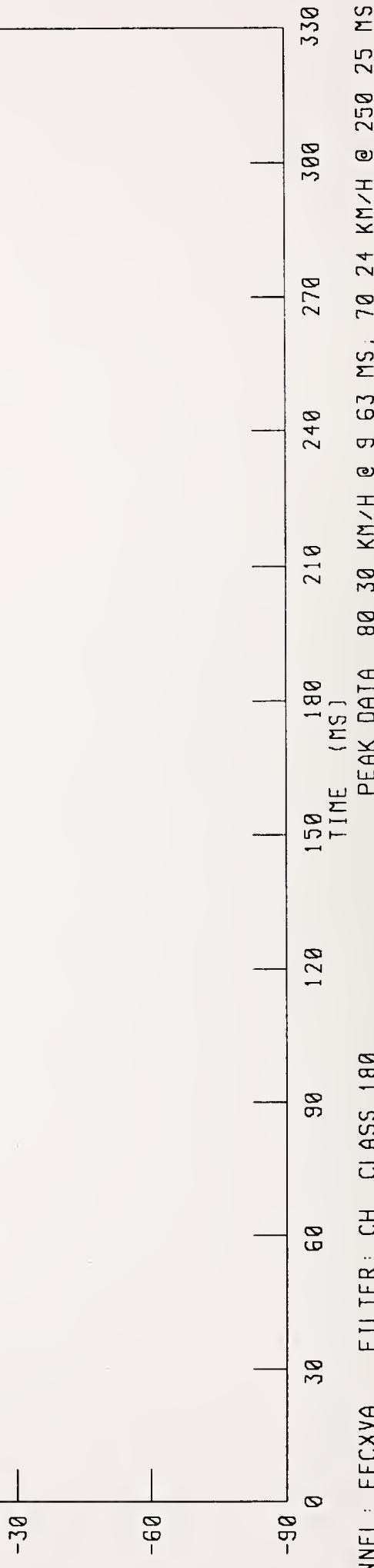
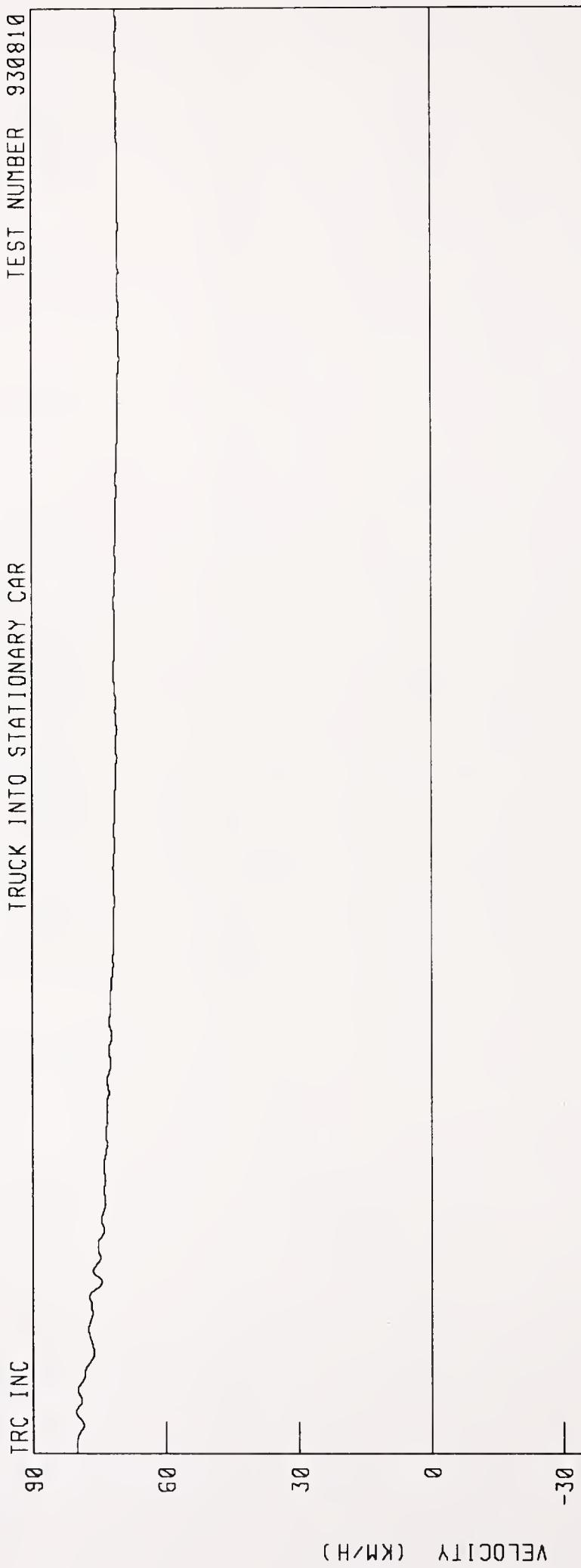
ACCELERATION (G)

CHANNEL FFCRGA FILTER CH CLASS 60
PEAK DATA 21 93 G @ 34 13 MS, 0 06 G @ -20 00 MS
TIME [MS] 130 160 190 220 250 280 310



REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
TRUCK FRONT FRAME CROSSMEMBER X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810



CHANNEL: FFCXVA FILTER: CH CLASS 180

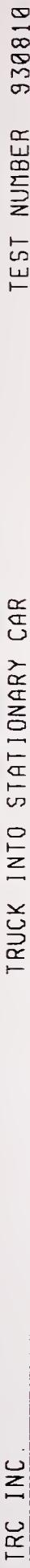
PEAK DATA 80 30 KM/H @ 963 MS, 70 24 KM/H @ 250 25 MS

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS VELOCITY

TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.



VELOCITY (KM/H)

0

-60

-90

0 30 60 90 120 150 180 210 240 270 300 330

TIME (MS)

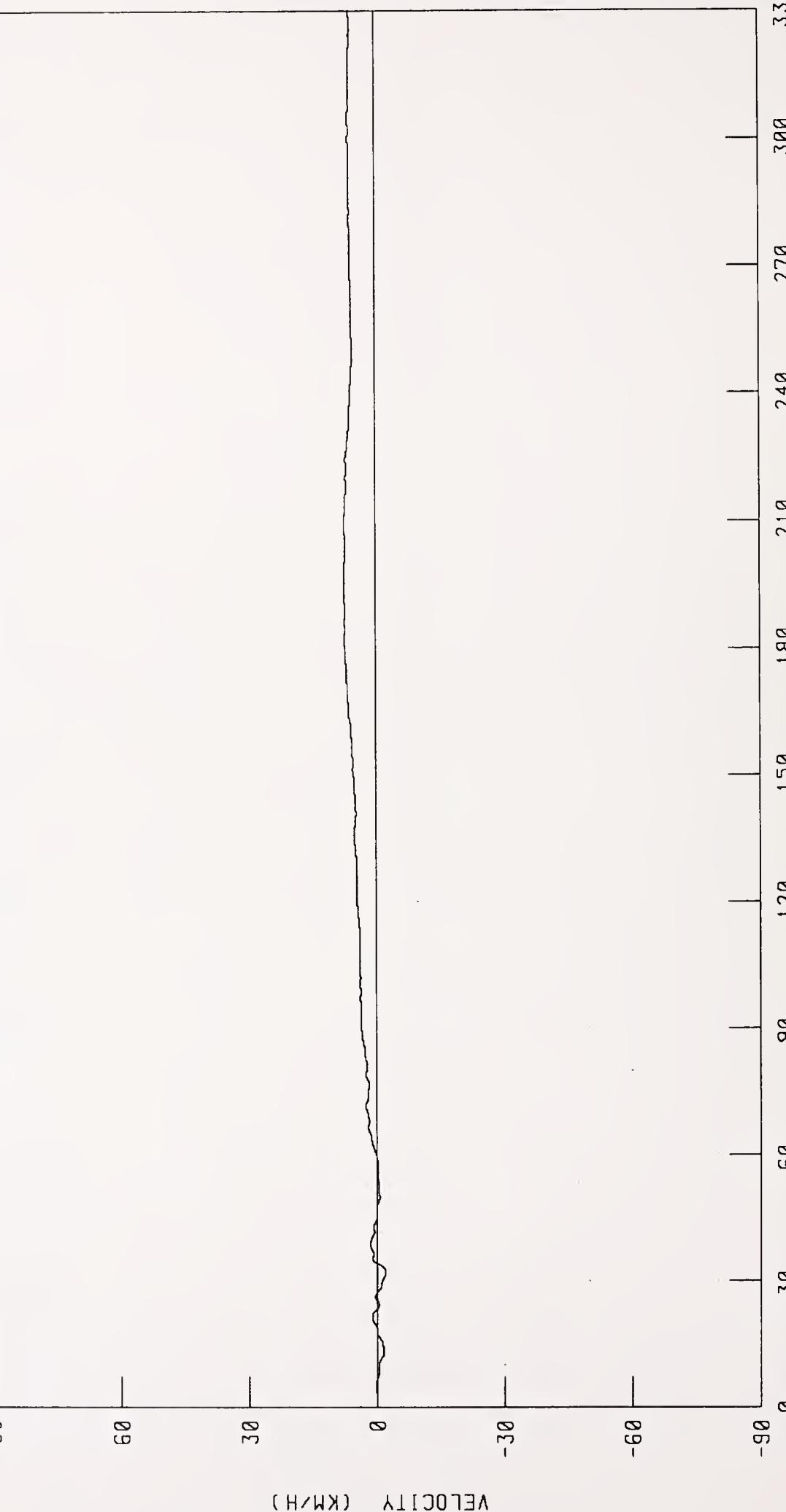
PEAK DATA 249 KM/H @ 105 25 MS, -368 KM/H @ 31 75 MS

CHANNEL FFCYVA FILTER CH CLASS 180

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.



CHANNEL : FFCZVA FILTER CH CLASS 180
PEAK DATA 7 46 KM/H @ 181 88 MS, -2 03 KM/H @ 32 25 MS

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
TRUCK CENTER OF GRAVITY X-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC.

60

40

20

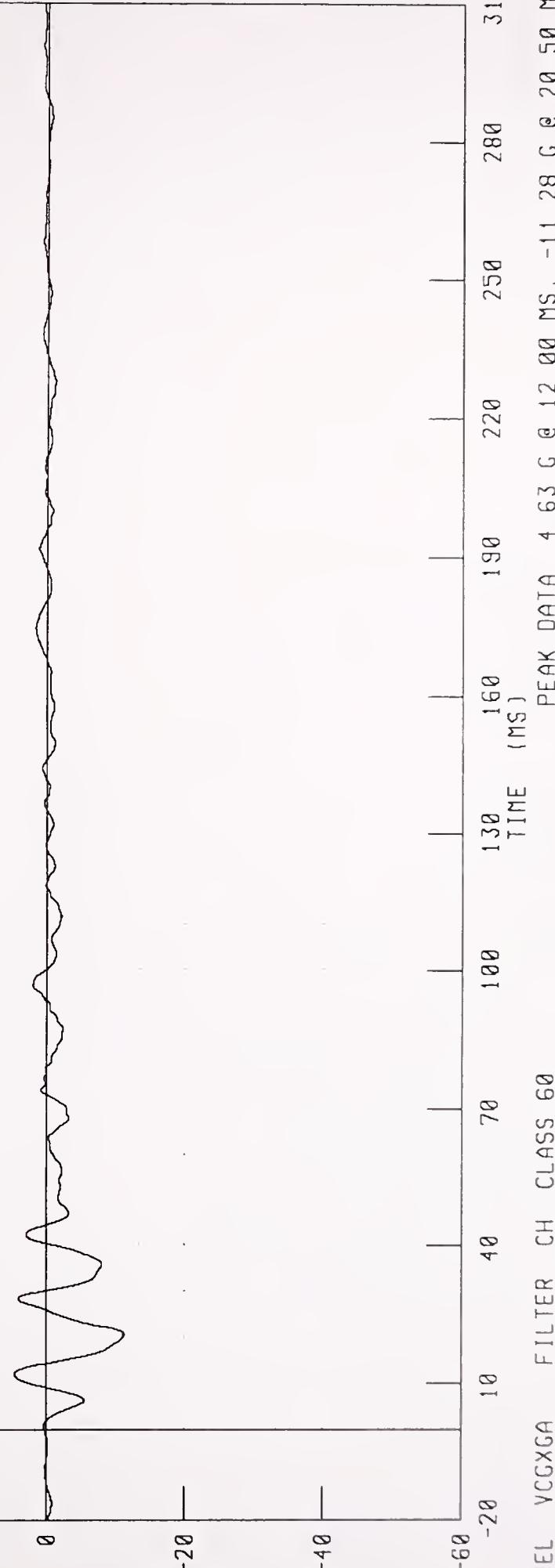
0

-20

-40

-60

ACCELERATION (G)



CHANNEL VCGXGA FILTER CH CLASS 60

PEAK DATA 4 63 G @ 12 00 MS, -11 28 G @ 20 50 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
TRUCK CENTER OF GRAVITY X-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

60

30

0

-30

-60

-90

VELOCITIY (KM/H)

CHANNEL VCGXVA FILTER CH CLASS 180

TIME (MS) PEAK DATA 80 12 KM/H @ 250 MS, 72 15 KM/H @ 166 13 MS

0 30 60 90 120 150 180 210 240 270 300 330

REDUCING HEAVY TRUCK AGGRESSIVENESS - TEST 17
TRUCK CENTER OF GRAVITY Y-AXIS ACCELERATION
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

40

20

0

-20

-40

-60

ACCELERATION (G)



CHANNEL VCCYGA FILTER CH CLASS 60

PEAK DATA 3 81 G @ 70 88 MS, -2 58 G @ 37 75 MS

REDUCING HEAVY TRUCK AGGRESSIONESS - TEST 17
TRUCK CENTER OF GRAVITY Y-AXIS VELOCITY
TRUCK INTO STATIONARY CAR

TEST NUMBER 930810

TRC INC

60

30

0

-30

-60

VELOCITY (KM/H)

CHANNEL VCGYVA FILTER: CH CLASS 180
PEAK DATA 3 82 KM/H @ 324 50 MS, -0 67 KM/H @ 40 50 MS
TIME (MS) 150 180 210 240 270 300 330

APPENDIX C

DUMMY CERTIFICATION INFORMATION



TRANSPORTATION RESEARCH CENTER INC.
 HYBRID III EXTERNAL DIMENSIONS
 48 HUMANOID

05-AUG-93

TRC	48C9ED1	572E SN48 EXT. DIMENSION CAL09
TEST PARAMETER (DIMEN.) : SPECIFICATION TEST RESULTS		
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226 - 231 MM	229. MM
CHEST CIRCUMFERENCE	(Y) 970 - 1001 MM	986. MM
WAIST CIRCUMFERENCE	(Z) 836 - 866 MM	851. MM
CHEST DEPTH	(D) 213 - 229 MM	218. MM
H-POINT HEIGHT	(C) 84 - 89 MM	86. MM
H-POINT FROM SEATBACK	(D) 135 - 140 MM	137. MM
SKULL CAP TO BACKLINE	(H) 41 - 46 MM	43. MM
TOTAL SITTING HEIGHT	(A) 879 - 889 MM	884. MM
HIGH CLEARANCE	(F) 140 - 155 MM	155. MM
BUTTOCK KNEE LENGTH	(K) 579 - 605 MM	597. MM
BUTTOCK POPLITEAL LENGTH	(N) 452 - 478 MM	470. MM
POPLITEAL HEIGHT	(L) 429 - 455 MM	432. MM
KNEE PIVOT HEIGHT	(M) 485 - 500 MM	493. MM
FOOT LENGTH	(P) 252 - 267 MM	259. MM
FOOT BREADTH	(W) 91 - 107 MM	99. MM
SHOULDER PIVOT FROM BACKLINE	(E) 84 - 94 MM	91. MM
SHOULDER BREADTH	(V) 422 - 437 MM	427. MM
SHOULDER PIVOT HEIGHT	(B) 506 - 521 MM	511. MM
ELBOW REST HEIGHT	(J) 191 - 211 MM	202. MM
SHOULDER-ELBOW LENGTH	(I) 330 - 345 MM	343. MM
BACK OF ELBOW TO WRIST PIVOT	(G) 290 - 305 MM	295. MM

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas. Middle L

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

05-AUG-93

TRC 48C9HD

572E SN48 HEAD DROP CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
ITEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10% - 70%	50.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	243.04 G
PEAK LATERAL ACCELERATION	15 G MAX	-1.72 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

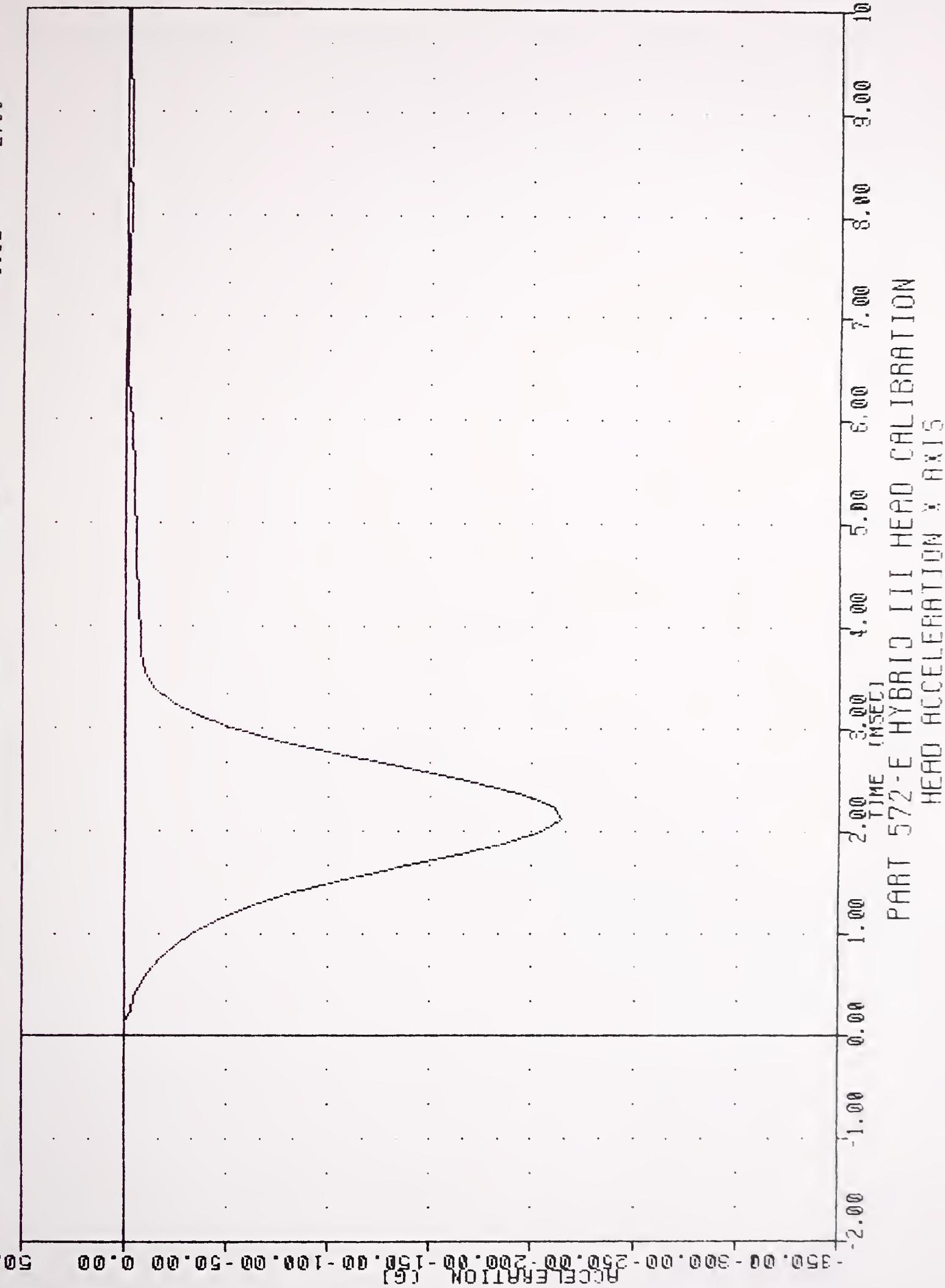
TEST MEETS SPECIFICATIONS

TECHNICIAN

Chas. Middlecamp

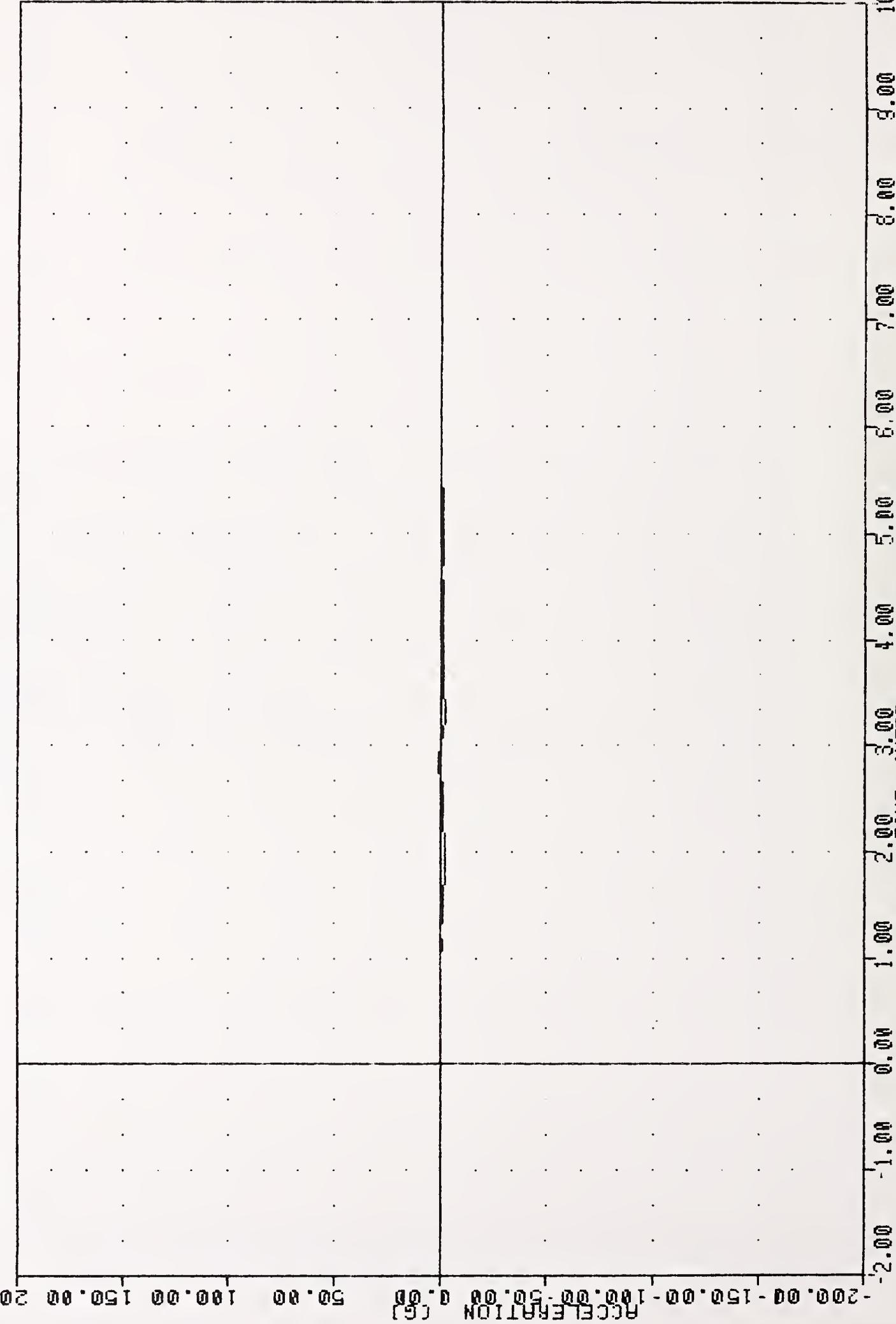
HPC
93217
HEODXG

572E SNOB HEAD DROP CAL 09
MIN. MAX VALUES = -213.94e 2.13 . -0.02 e -2.00



572E SINE HEAD DROP CAL 09
93217 HEADS
TRC

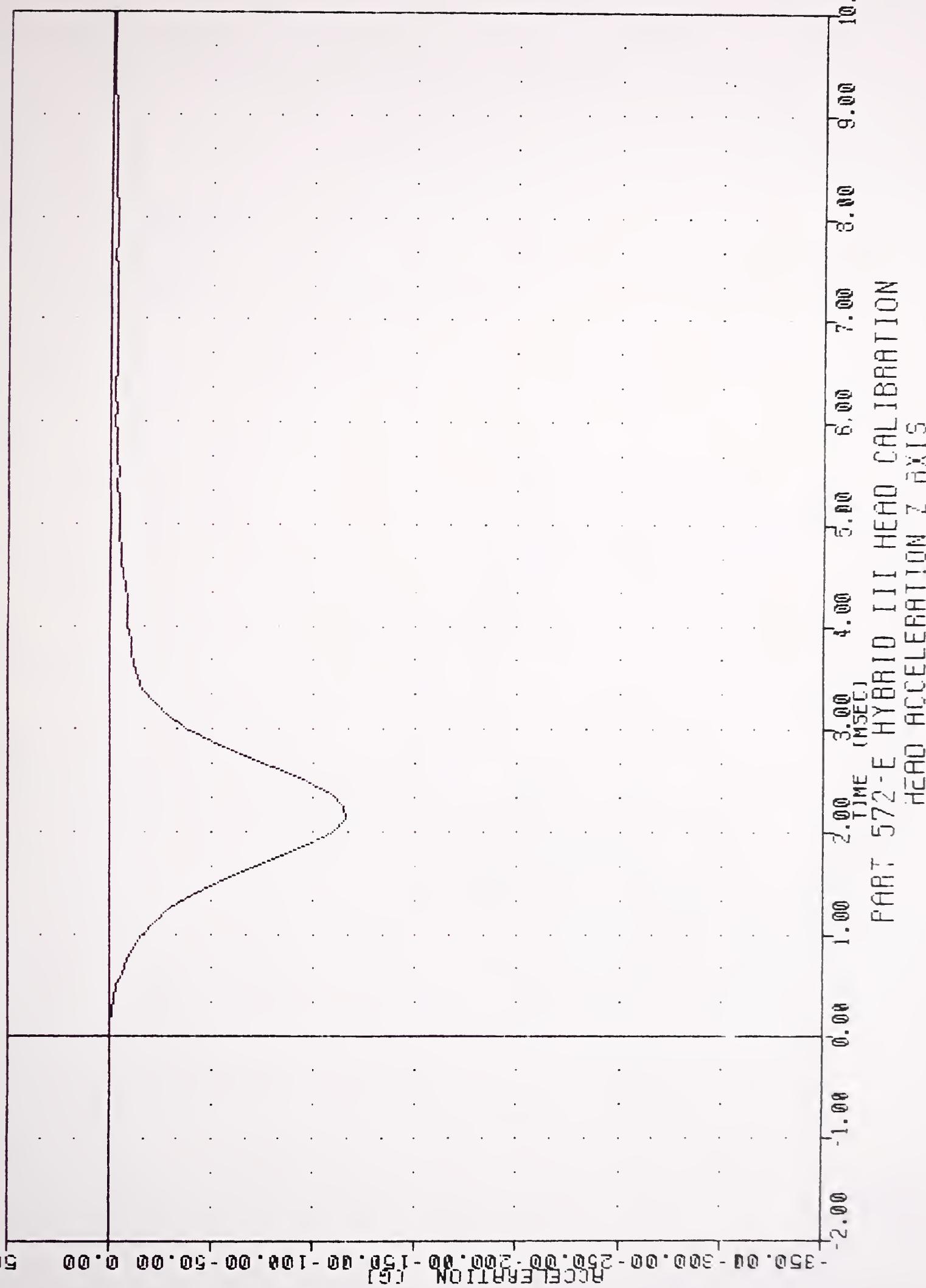
FILTER = HPF 1650/ 5214/-40
MIN, MAX VALUES = -1.72e - 1.98e
1.30e 2.88



PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

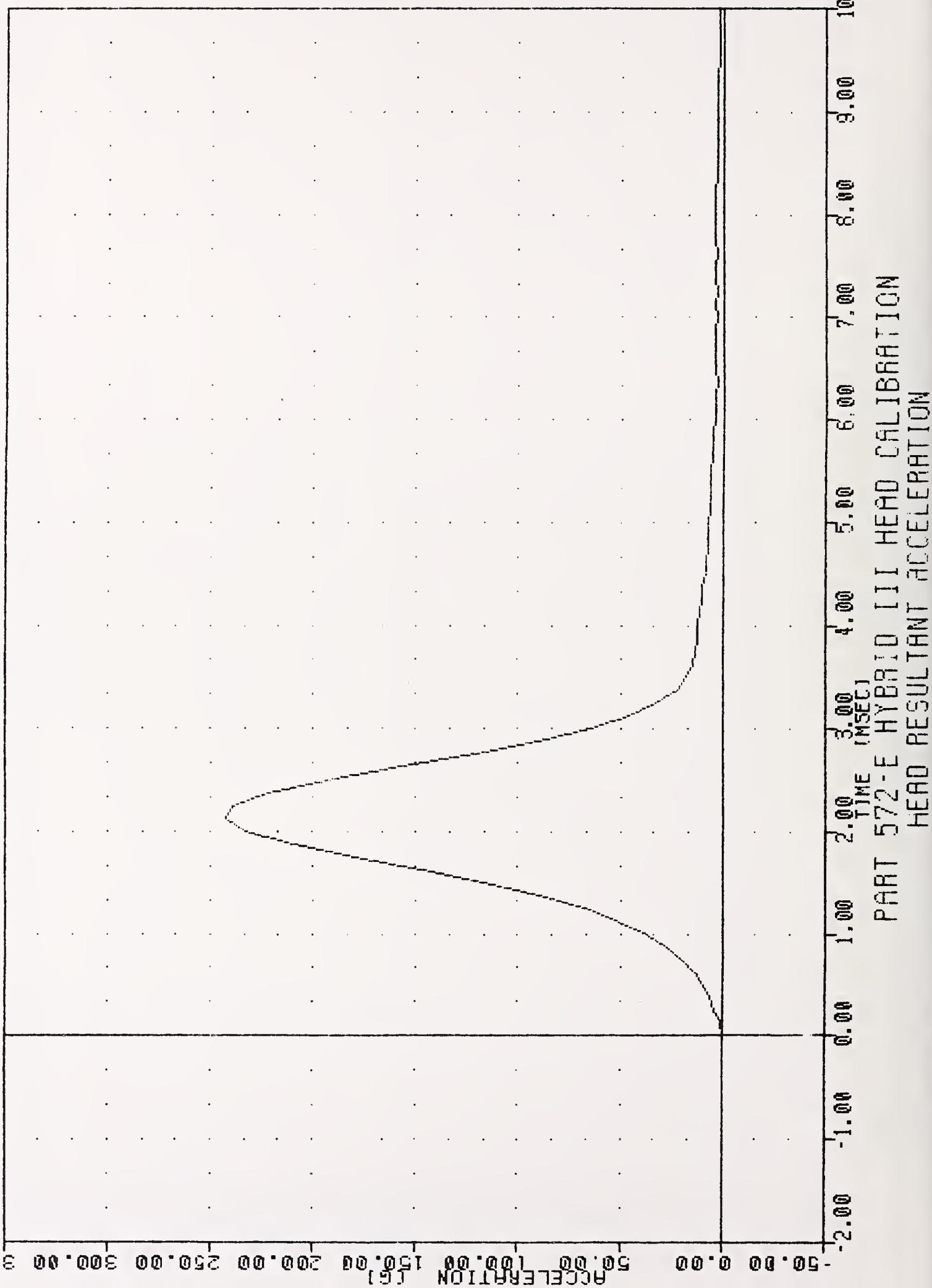
TRC
48C9HD
572E SN48 HEAD DROP CAL 09
93217
HEDIG

FILTER = FILPF 1650/ 5214/ -40
MIN. MAX VALUES = -115.328 2.13 , 0.07 8 -0.25



TRC
572E SNAK HEAD DRAFT CAL 09
93217 HEDRG

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = 0.038 -2.00 , 243.04 & 2.13



TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST

HYBRID III

05-AUG-93

6 AXIS NECK TRANSDUCER
TRC 48C9NF1

572E SN48 NECK FLEXION CAL09

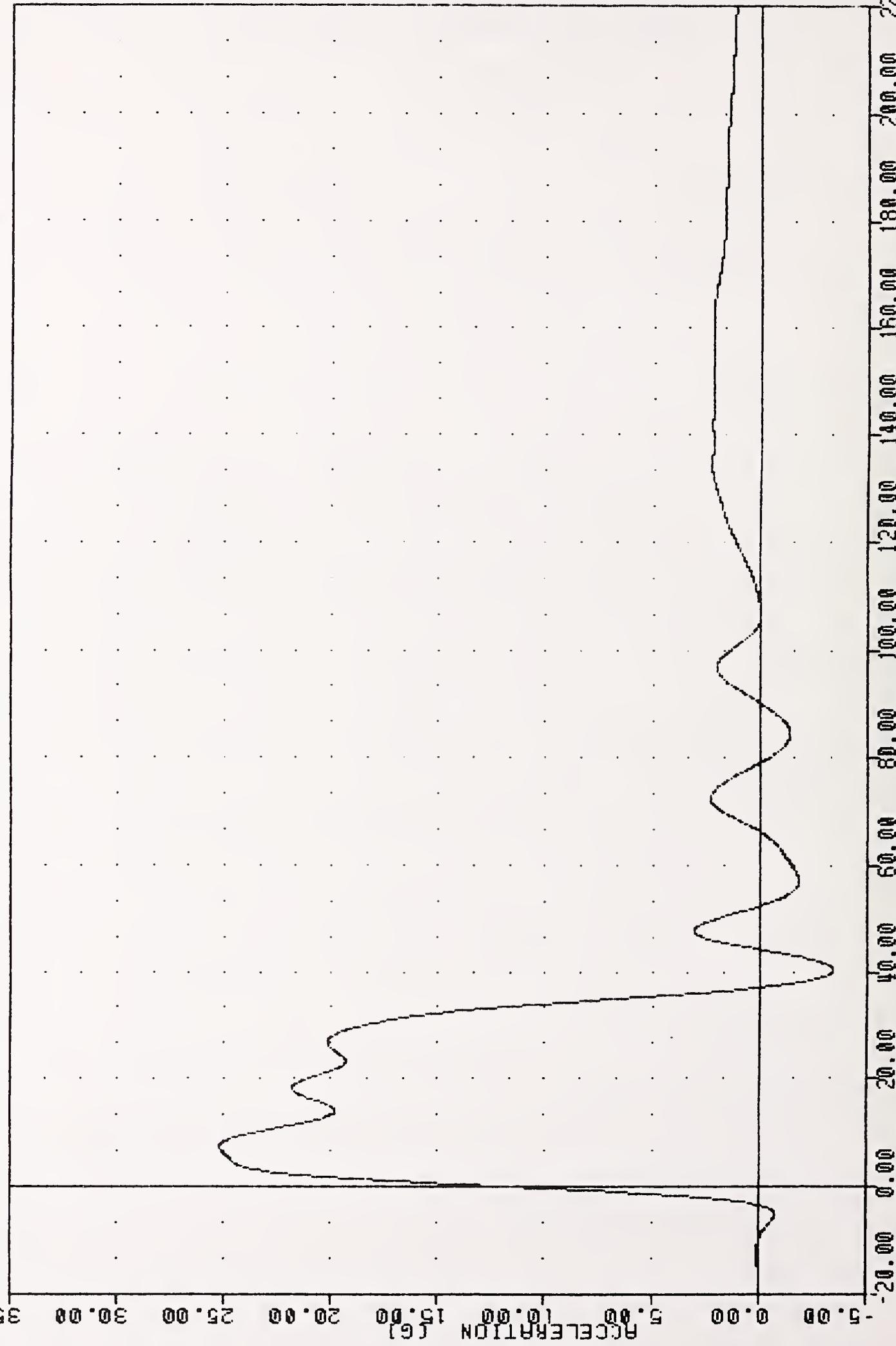
TEST PARAMETER	SPECIFICATION	TEST RESULTS
ITEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
IRELATIVE HUMIDITY	10% - 70%	50.0 %
IIMPACT VELOCITY	6.89 - 7.13 M/SEC	7.10 M/SEC
PENDULUM	10 MS 22.50 - 27.50 G	23.51 G
DECELERATION	20 MS 17.60 - 22.60 G	21.09 G
	30 MS 12.50 - 18.50 G	18.40 G
IMAX PENDULUM G	29 G MAX	25.19 G
IMAX PENDULUM G ABOVE 30 MS	29 G MAX	18.26 G
IDECCELERATION-TIME CURVE		
IDECAY TIME TO 5 G	34 - 42 MS	35.25 MS
R PLANE	MAX 64 - 78 DEG.	75.10 DEG.
ROTATION	TIME 57 - 64 MS	58.63 MS
MOMENT ABOUT OCCIPITAL	MAX 88.2 - 108.5 NM	94.52 NM
CONDYLE	TIME 47 - 58 MS	48.38 MS
ROTATION ANGLE-TIME CURVE		
IDECAY TIME TO ZERO	113 - 128 MS	117.38 MS
POSITIVE MOMENT-TIME CURVE		
IDECAY TIME TO ZERO	97 - 107 MS	98.38 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Char Middleton

TRC 48CGNF1
572E SN48 NECK FLEXION CAL09
93217 PENX6

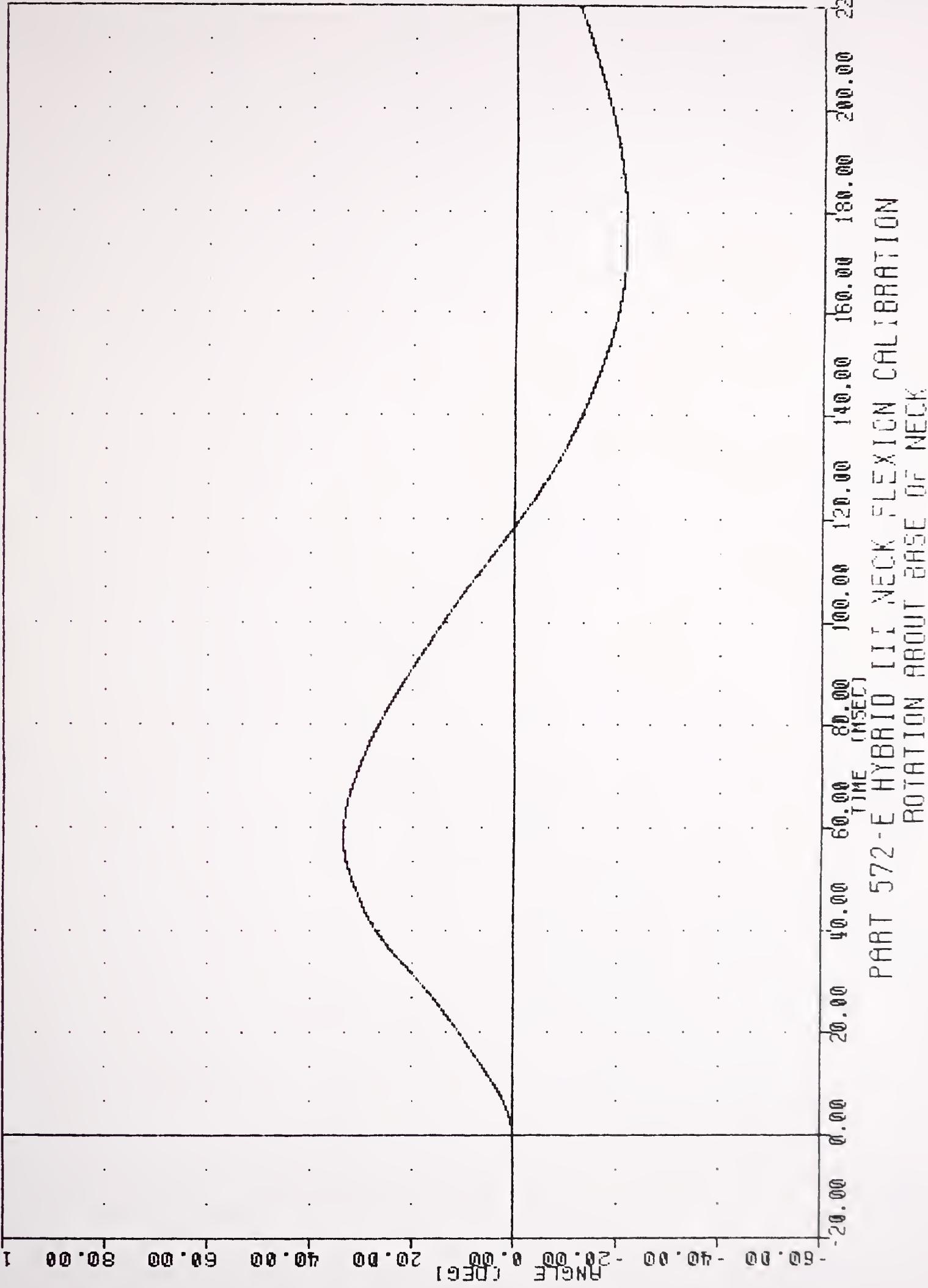
FILTER = BLPP 100/
MIN, MAX VALUES = -3.46e -40
25.20 e 7.38



PART 572-E HYBRID LI LI NECK FLEXION CALIBRATION
PENDULUM DECELERATION

TREC
572E SN40 NECK FLEXION CAL09
93217
BETA

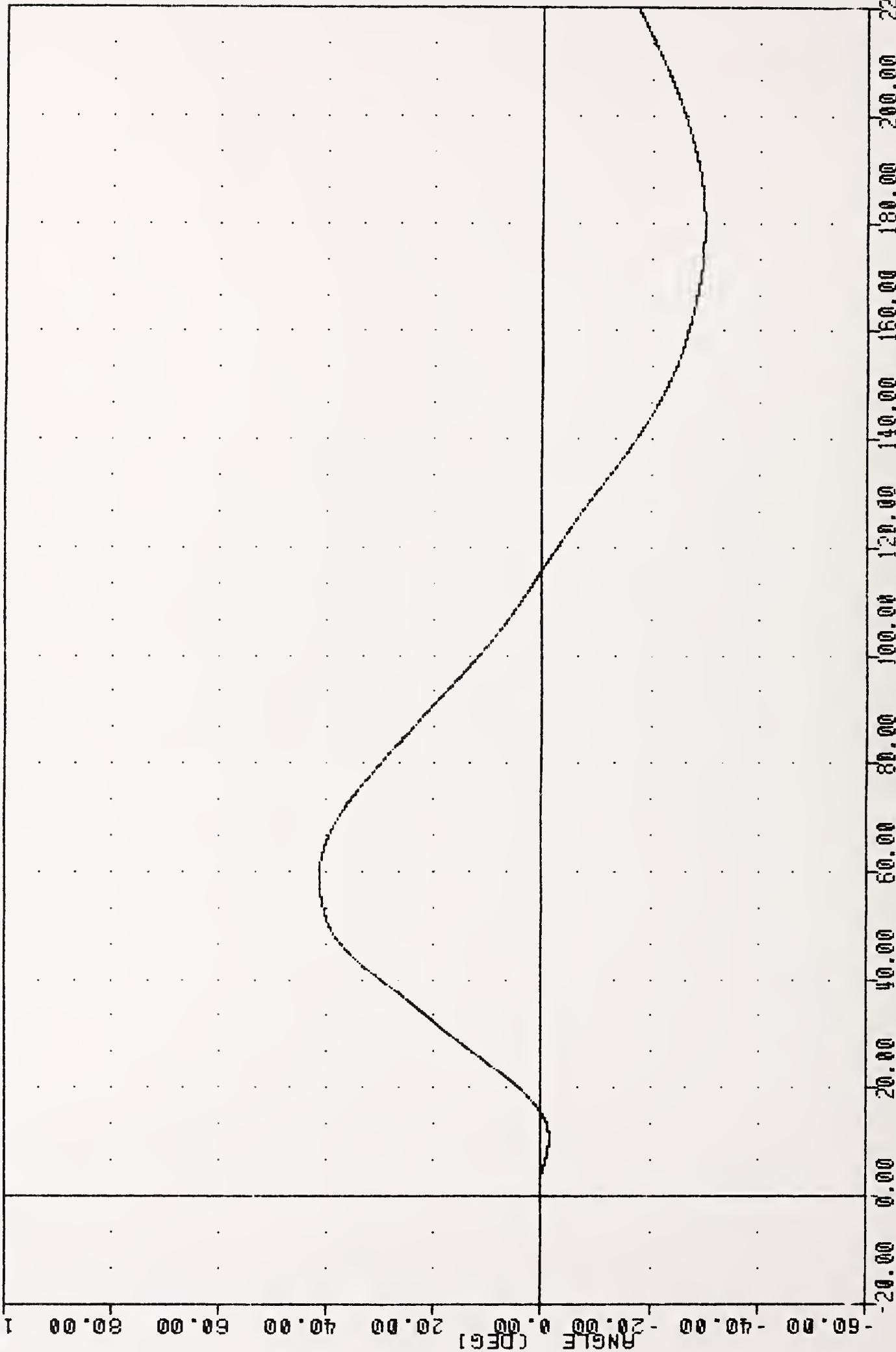
FILTER = BLPP 100/ 317/ -40
MIN, MAX VALUES = -21.378 171.50 . 33.63 & 58.50



PART 572-E HYBRID II: NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

TRC
572E SWAB NECK FLEXION CALIBR.
93217
THETA

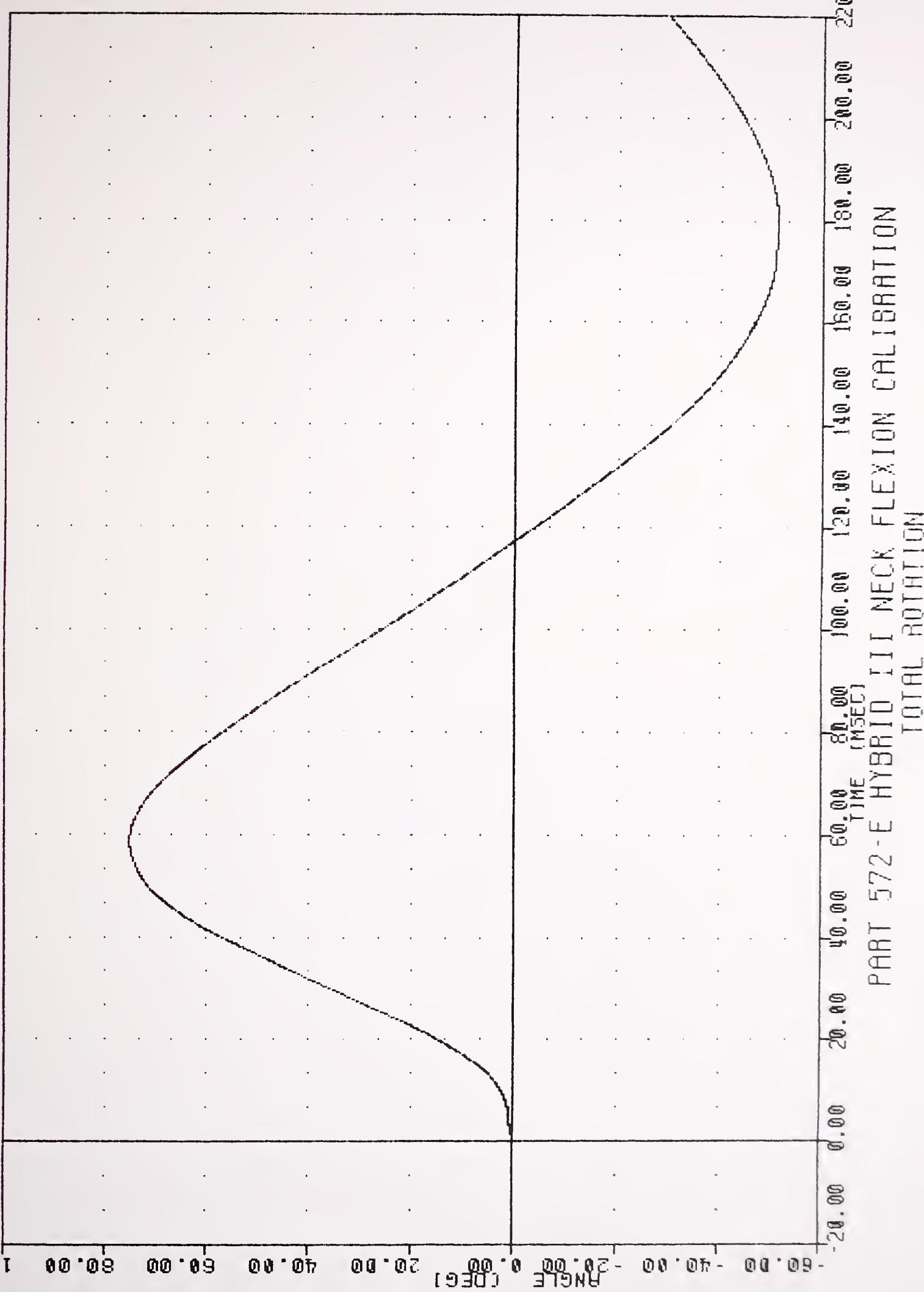
FILTER = BLPP 100/ 317/-40
MIN, MAX VALUES = -29.90 & 179.38 , 41.43 & 58.88



PART 572-E HYBRID LI LI NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONNOYLE

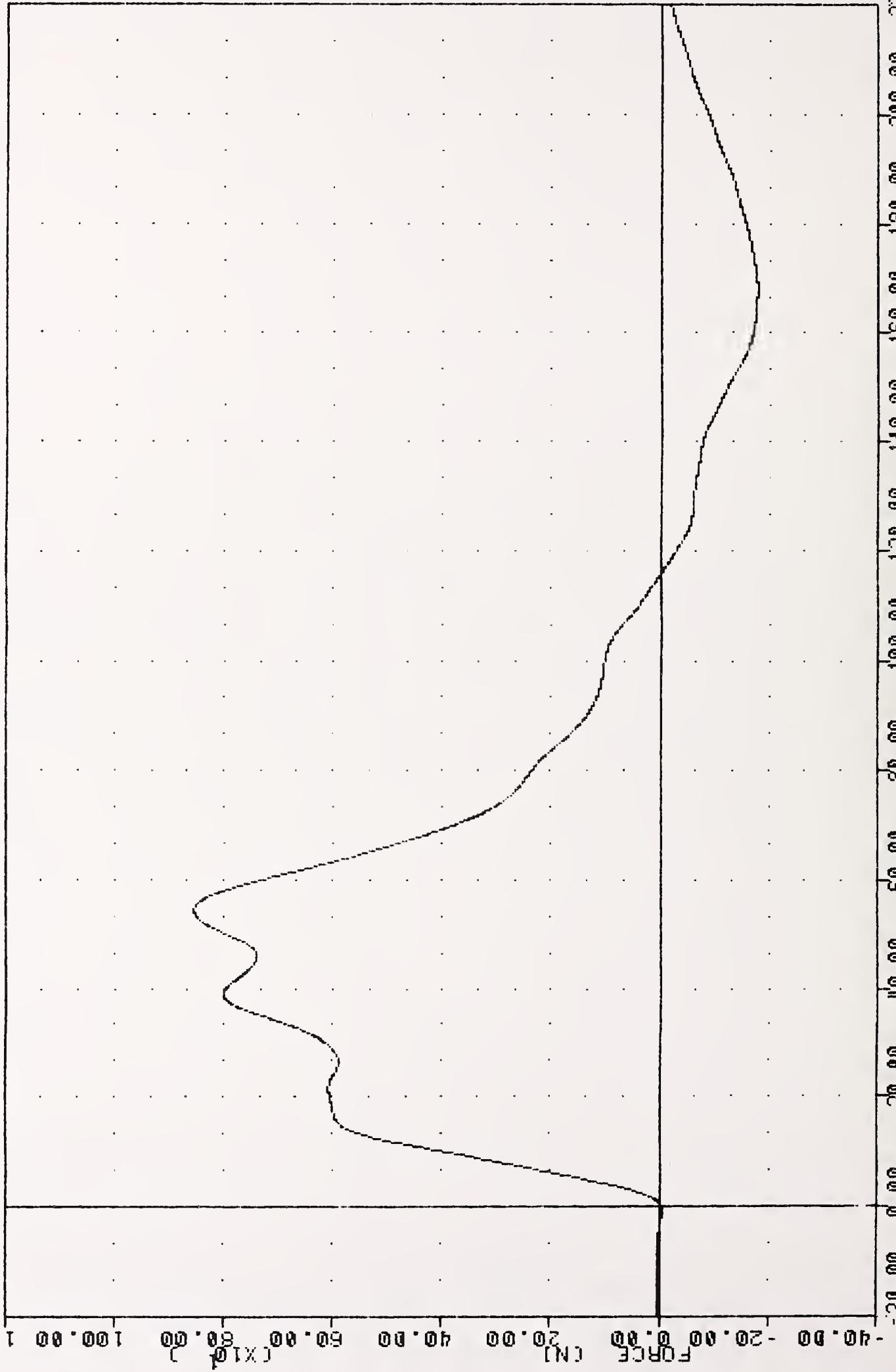
IRG
572E SN48 NECK FLEXION CALIBRATIONS
93217
TOTAL

FILTER = BLPP 100/-317/-40
MIN, MAX VALUES = -51.278 179.38 ,
75.10 & 58.63



TRC • 48C9NF1
572E SN49 NECK FLEXION CAL09
93217
NEKXF

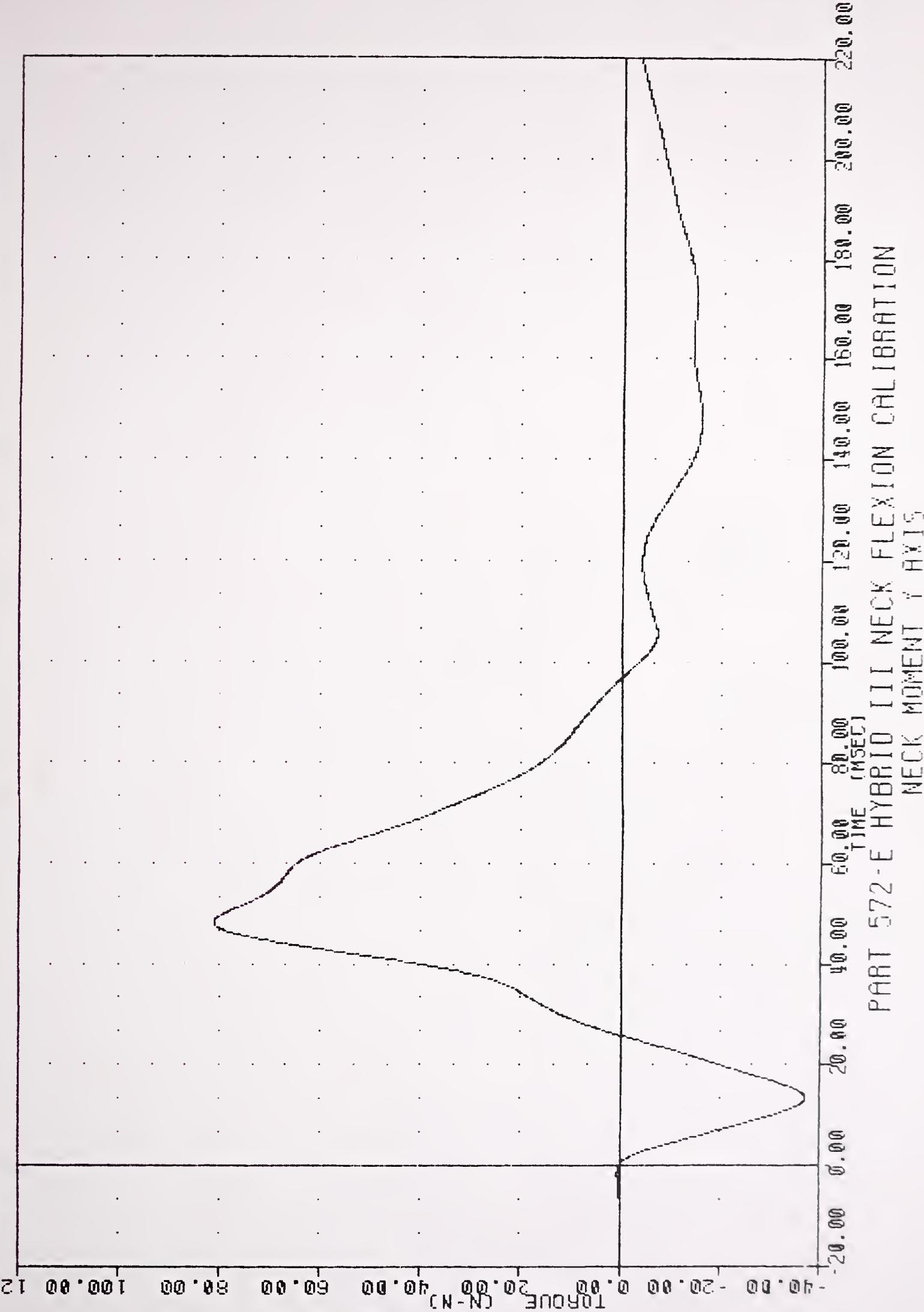
FILTER = BLFP 100/ 317/ -40
MIN, MAX VALUES = -178.38 & 168.13 , 853.63 & 54.38



PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS

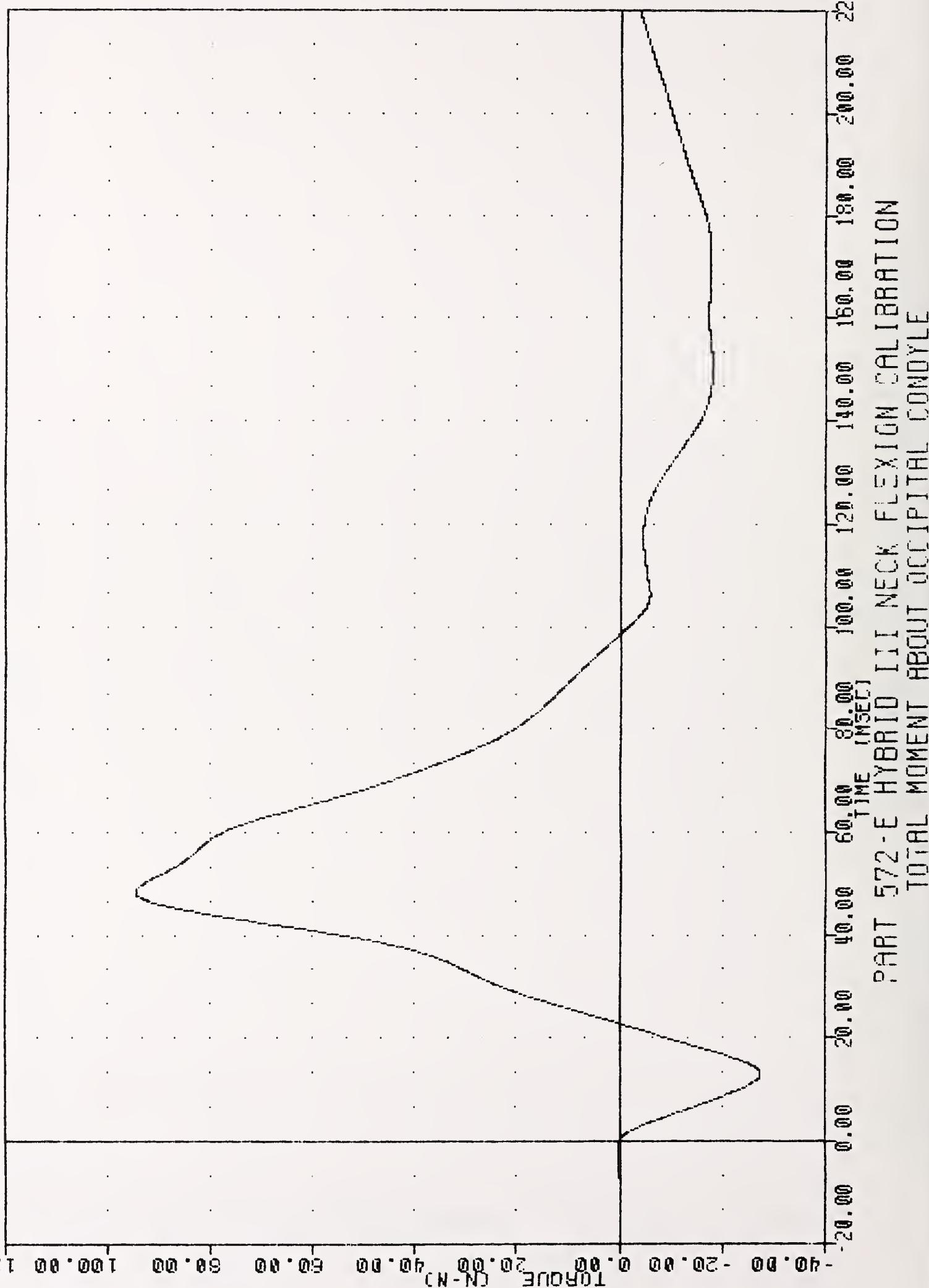
IRC
572E SN48 NECK FLEXION CAL09
93217
NEKYM

FILTER = BLPP 100/
MIN. MAX VALUES = -37.21@ 13.38 ,
81.04 @ 48.25



TRC
572E SN48 NECK FLEXION CAL@9
93217
NEKOM

4809NF1
572E SN48 NECK FLEXION CAL@9
FILTER = BLPP 100/
MIN, MAX VALUES = -27.48@ 12.88 ,
94.52 @ 48.38



TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST

HYBRID III

05-AUG-93

6 AXIS NECK TRANSDUCER
TRC 48C9NE1

572E SN48 NECK EXT. CAL 09

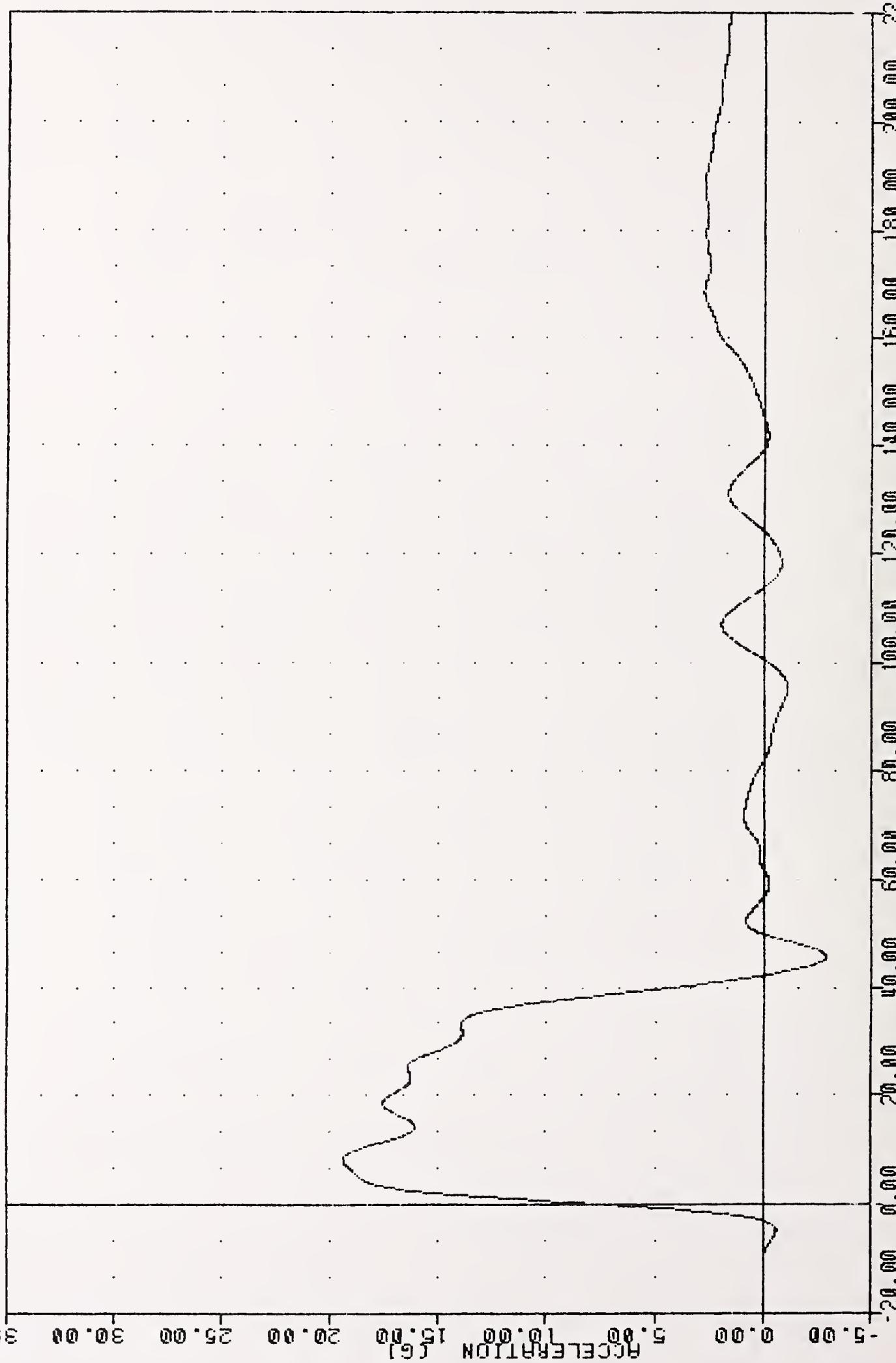
TEST PARAMETER	SPECIFICATION	TEST RESULTS
ITEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMINITY	10% - 70%	50.0 %
IMPACT VELOCITY	5.95 - 6.19 M/SEC	6.00 M/SEC
PENDULUM	10 MS 17.20 - 21.20 G 18.76 G	
DECELERATION	20 MS 14.00 - 19.00 G 17.24 G	
	30 MS 11.00 - 16.00 G 14.12 G	
MAX PENDULUM G	22 G MAX	19.41 G
MAX PENDULUM G ABOVE 30 MS	22 G MAX	14.08 G
DECELERATION-TIME CURVE		
DECAY TIME TO 5 G	38 - 46 MS	39.50 MS
B PLANE	MAX 81 - 106 DEG. 98.86 DEG.	
ROTATION	TIME 72 - 82 MS	75.38 MS
MOMENT ABOUT OCCIPITAL	MIN -80.0/-52.9 NM	-71.16 NM
CONDYLE	TIME 65 - 79 MS	69.63 MS
ROTATION ANGLE-TIME CURVE		
DECAY TIME TO ZERO	147 - 174 MS	156.50 MS
NEGATIVE MOMENT-TIME CURVE		
DECAY TIME TO ZERO	120 - 148 MS	143.25 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN *Char. Middleット*

TRC
572E SNUB NECK EXT. CALIB
93217 PENXG

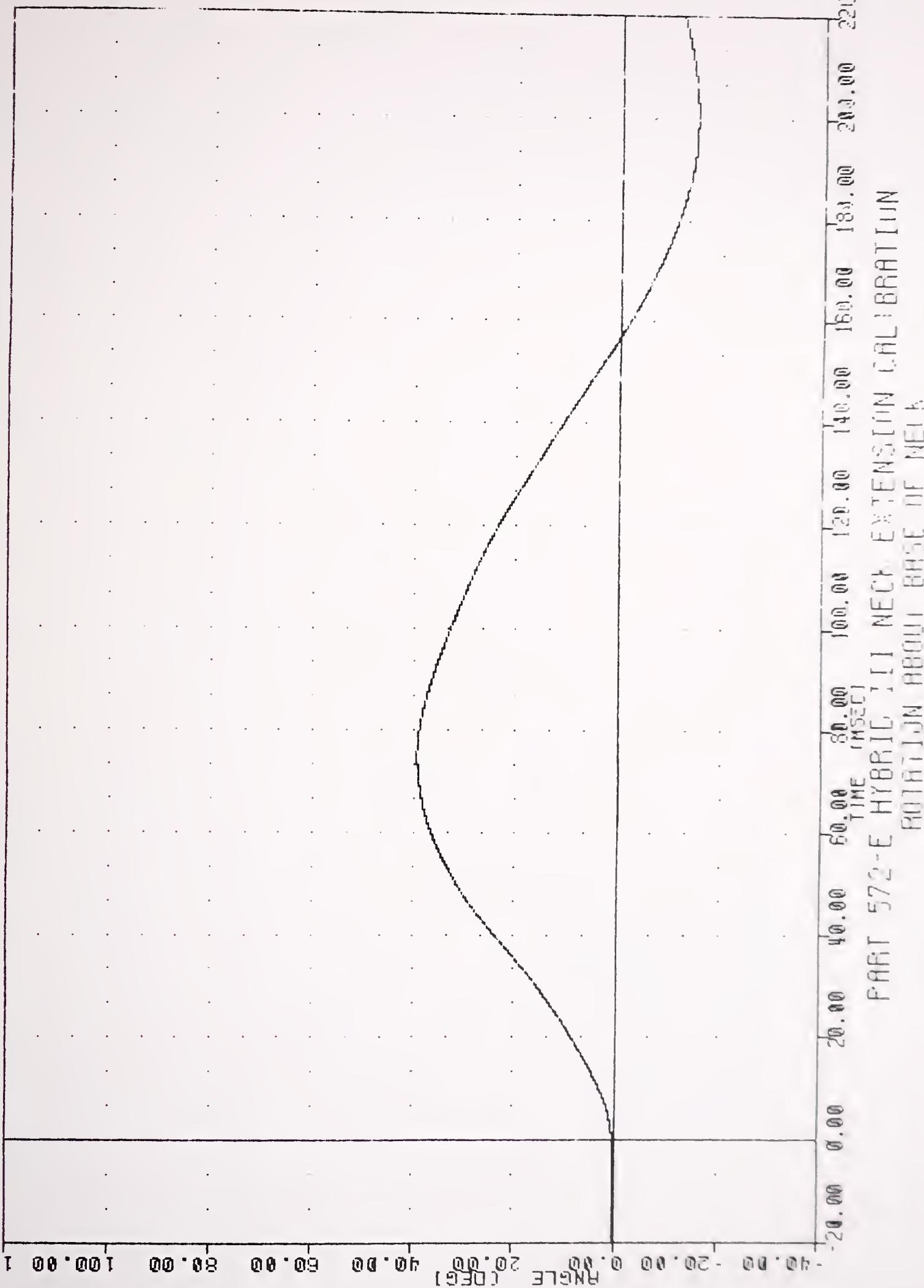
FILTER = BLPF 100/ 317/ -40
MIN. MAX VALUES = -2.938 45.75 .
19.41 e 8.25



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION

TRC
572-E SMC NECR EXT. CALIB
93217 48CNE1

FILTER = BLPP 100/- 317/- 40
MIN, MAX VALUES = -14.900 200.75 , 39.49 & 74.75

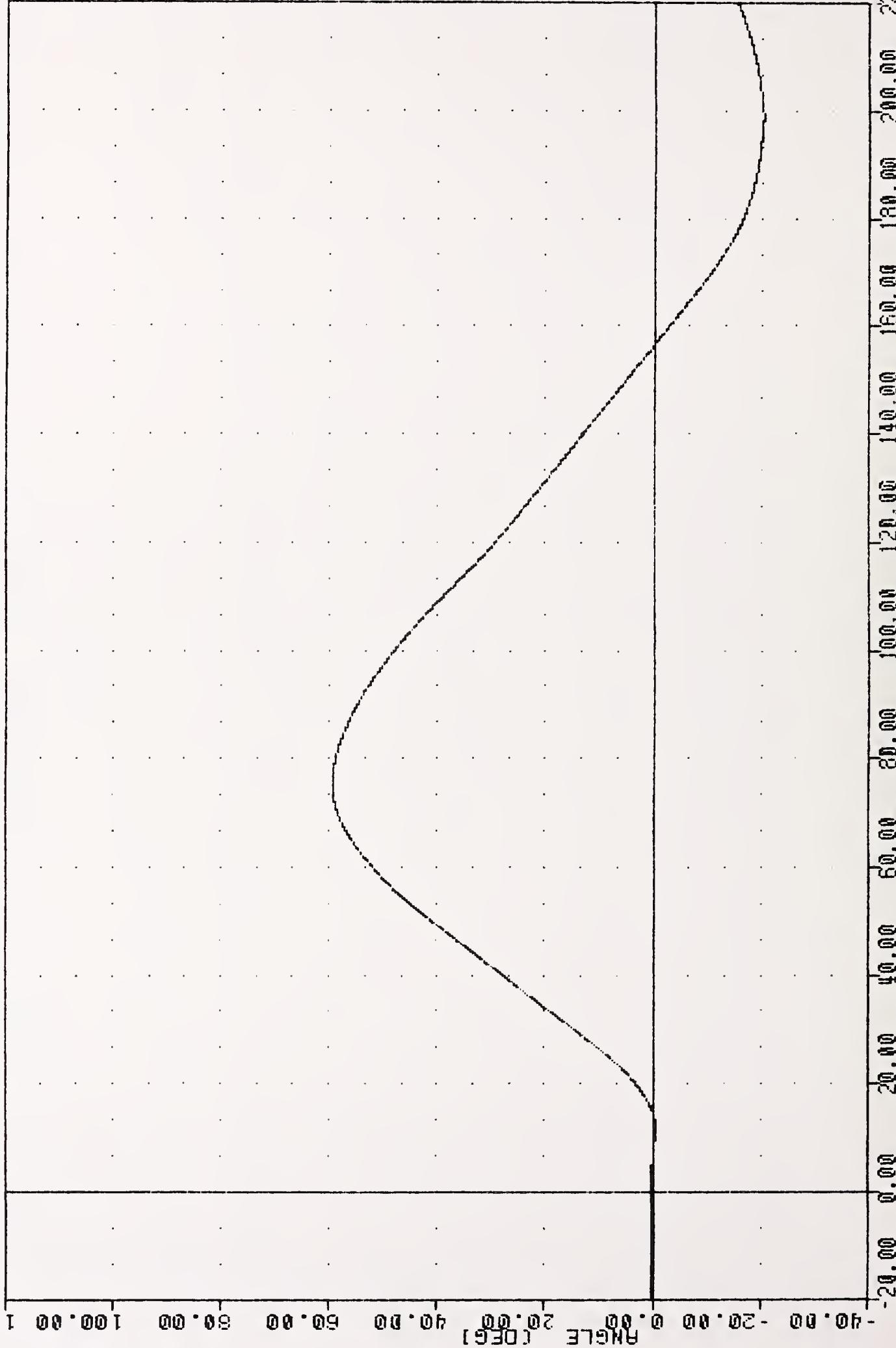


PART 572-E HYBRID LI MECH EXTENSION CALIBRATION
FOLIAR LINE PREGO! BRISE OF MEK

20.00 0.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00 220.00

HRC
572E SN49 NECK EXT. CAL09
93217
THETA

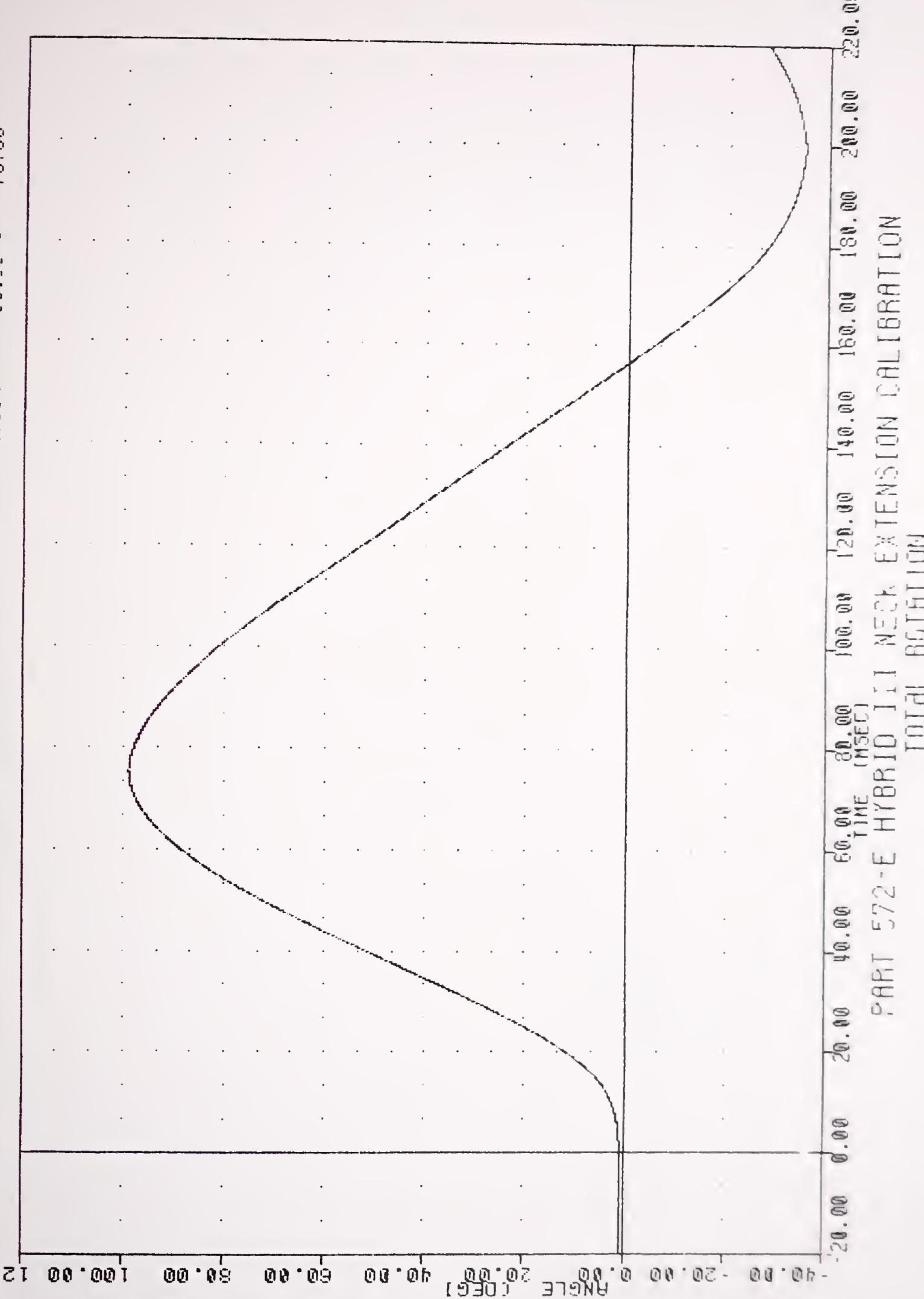
FILTER = ELPF 100/-317/-40
MIN. MAX VALUES = -20.35@ 199.13 . 59.37 @ 75.63



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONVOYLE

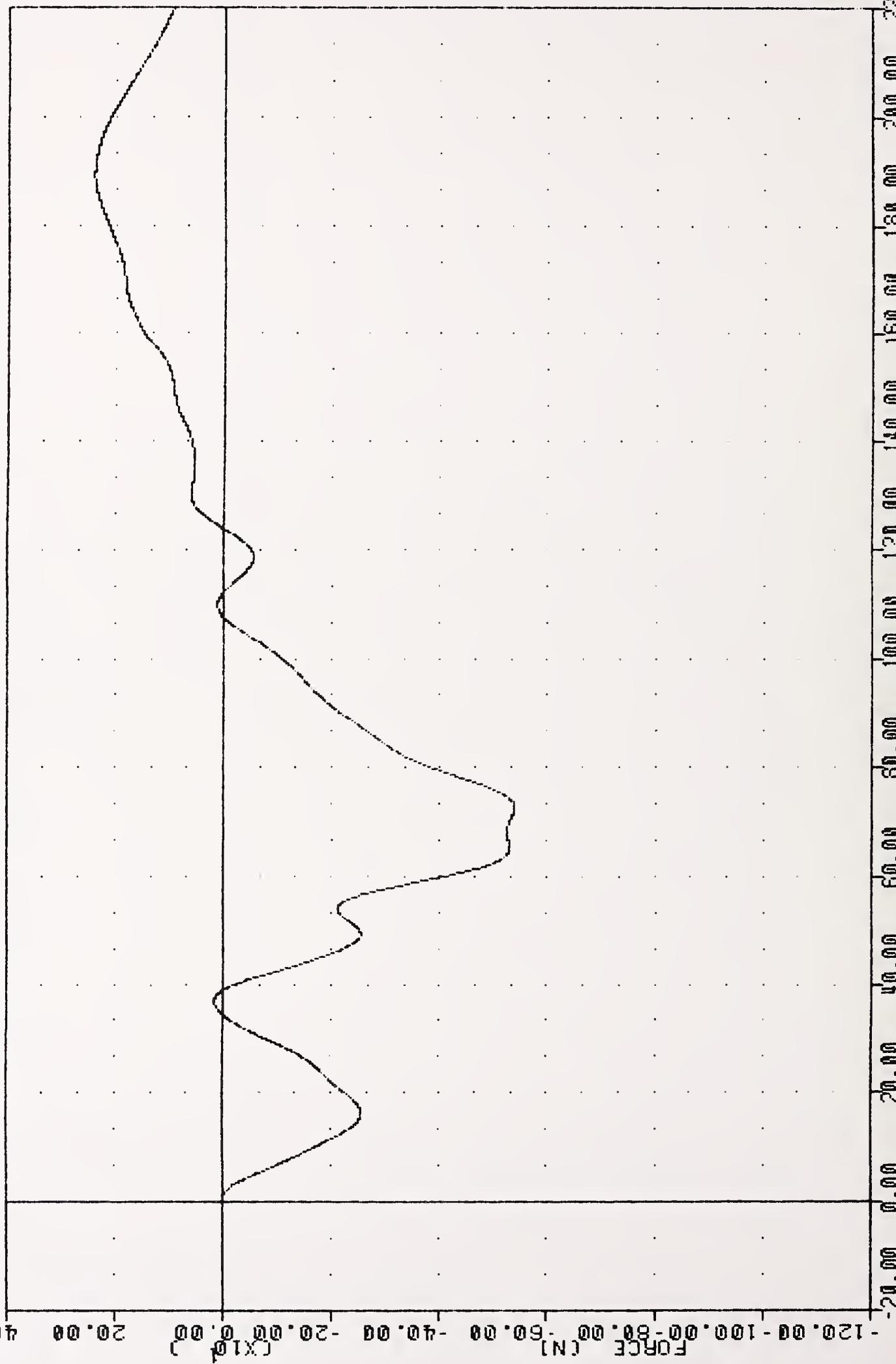
TAC
572E SN48 NECK EXT. CAL09
93217
TOTAL

FILTER = BLPP 100/
MIN. MAX VALUES = -35.248 199.63 , 98.86 e 75.38



TRC 48CANE1
572E SN48 NECK EXT. CAL09
93217 NEKXF

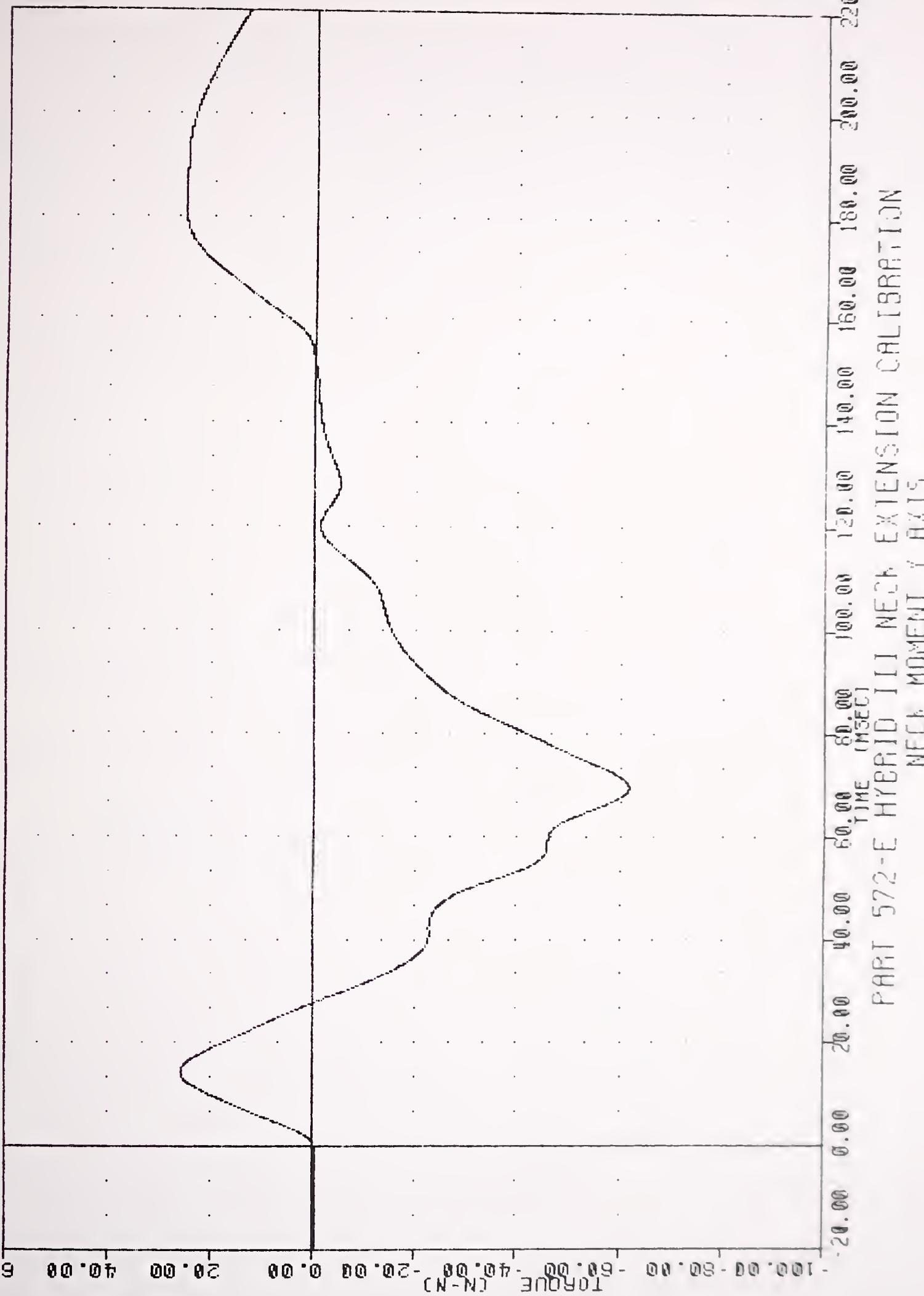
FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -540.758 72.63 , 239.60 & 189.25



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS

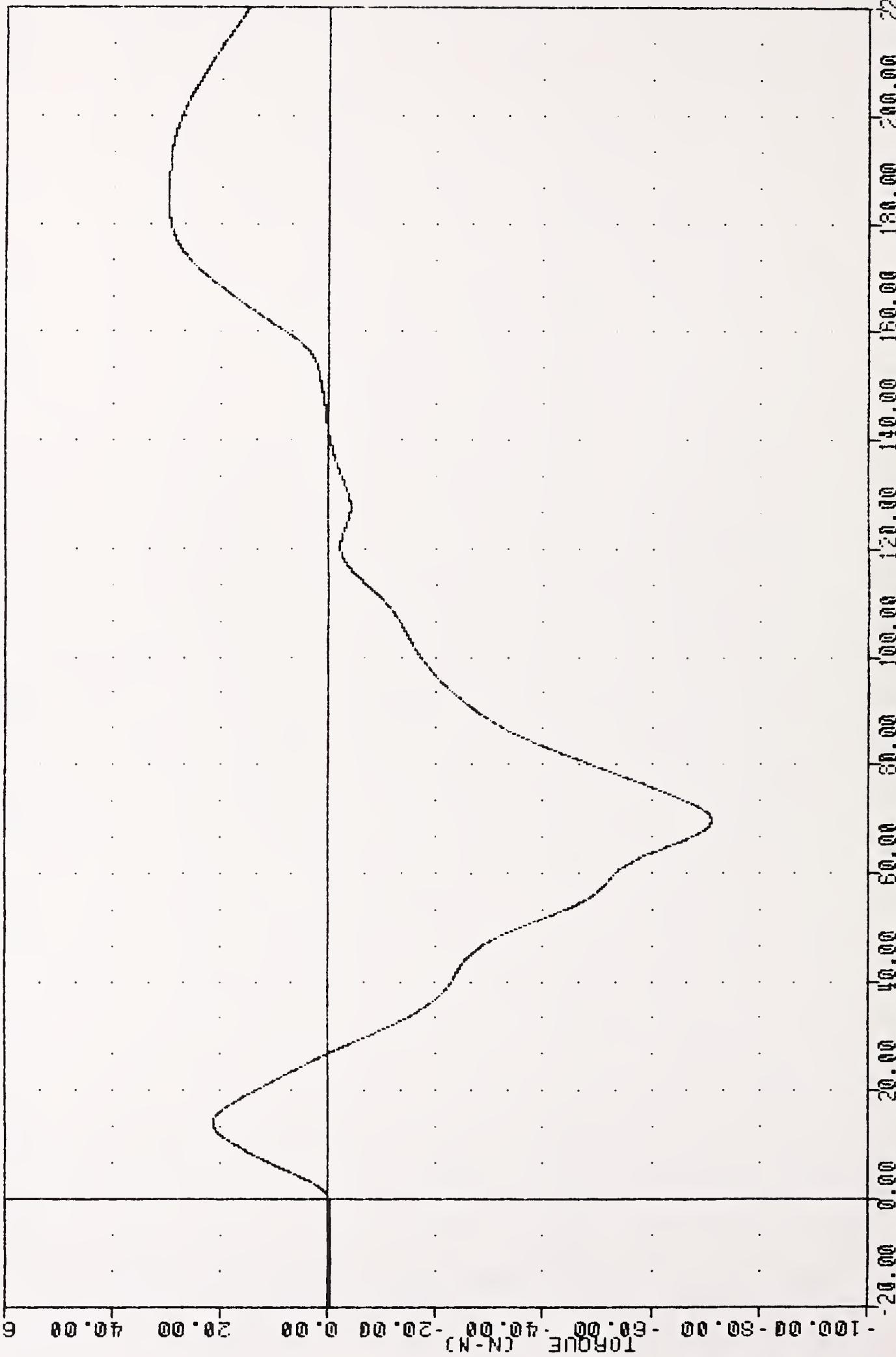
TRC
572E SN40 NECK EXT. CALD9
93217
NEKYM

FILTER = BLPP 1@0/ -317/-40
MIN. MAX VALUES = -61.748 69.50 , 25.69 & 182.63



TRC
572E SN48 NECK EXT. CALD9
93217
NEKOM

FILTER = BLPP 100/ 317/ -40
MIN. MAX VALUES = -71.168 69.63 , 29.74 * 184.38



-100.00 -80.00 -60.00 -40.00 -20.00 0.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00 220.00

TIME (msec)
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

05-AUG-93

TRC 48C9TH1 572E SN98 H.S. THORAX CAL09

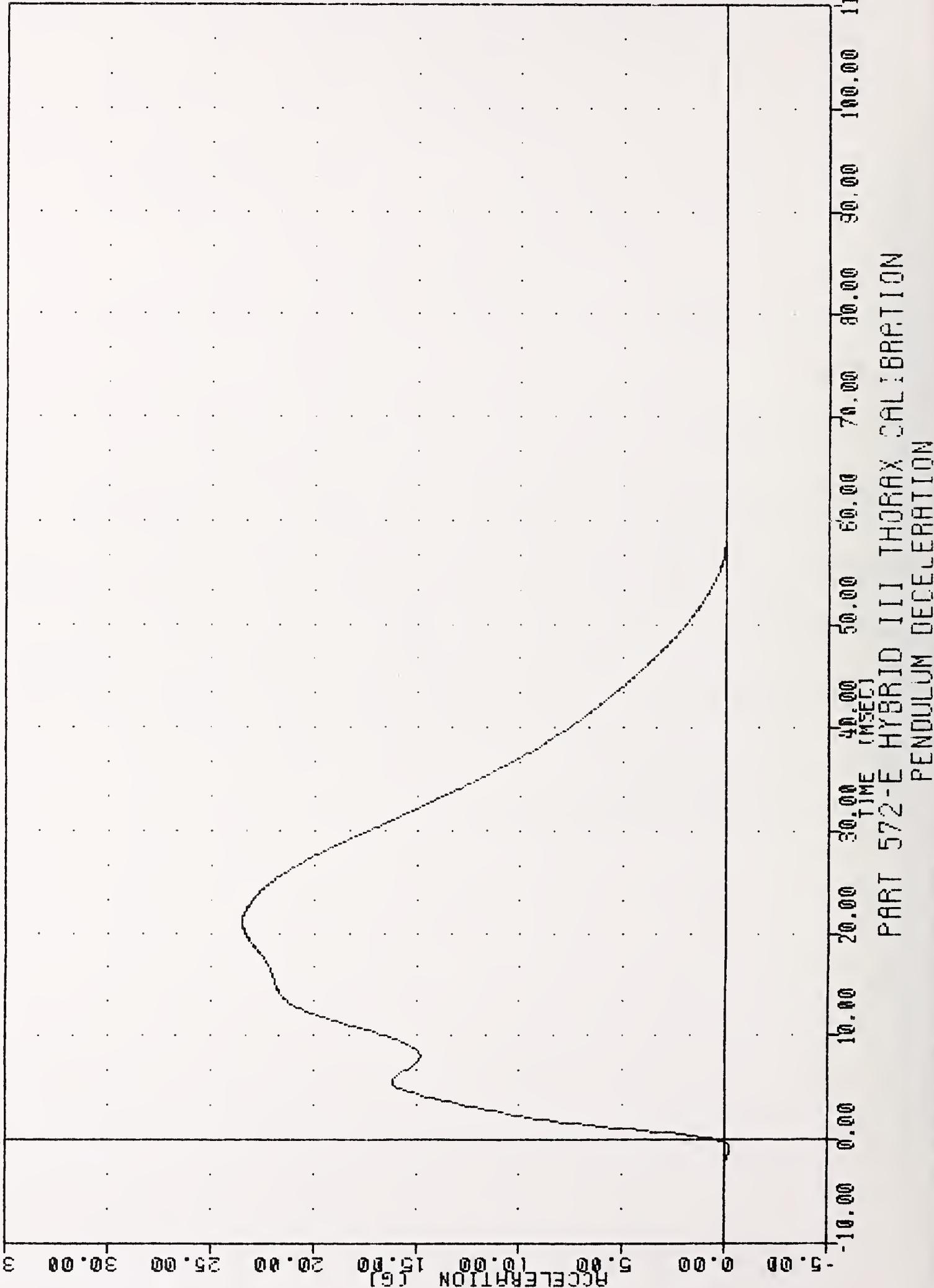
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10% - 70%	50.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/SEC	6.68 M/SEC
MAXIMUM DEFLECTION	63.5 - 72.6 MM	72.4 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5384. N
INTERNAL HYSTERESIS	69% - 85%	71.1%

TEST MEETS SPECIFICATIONS

TECHNICIAN Char Middleton

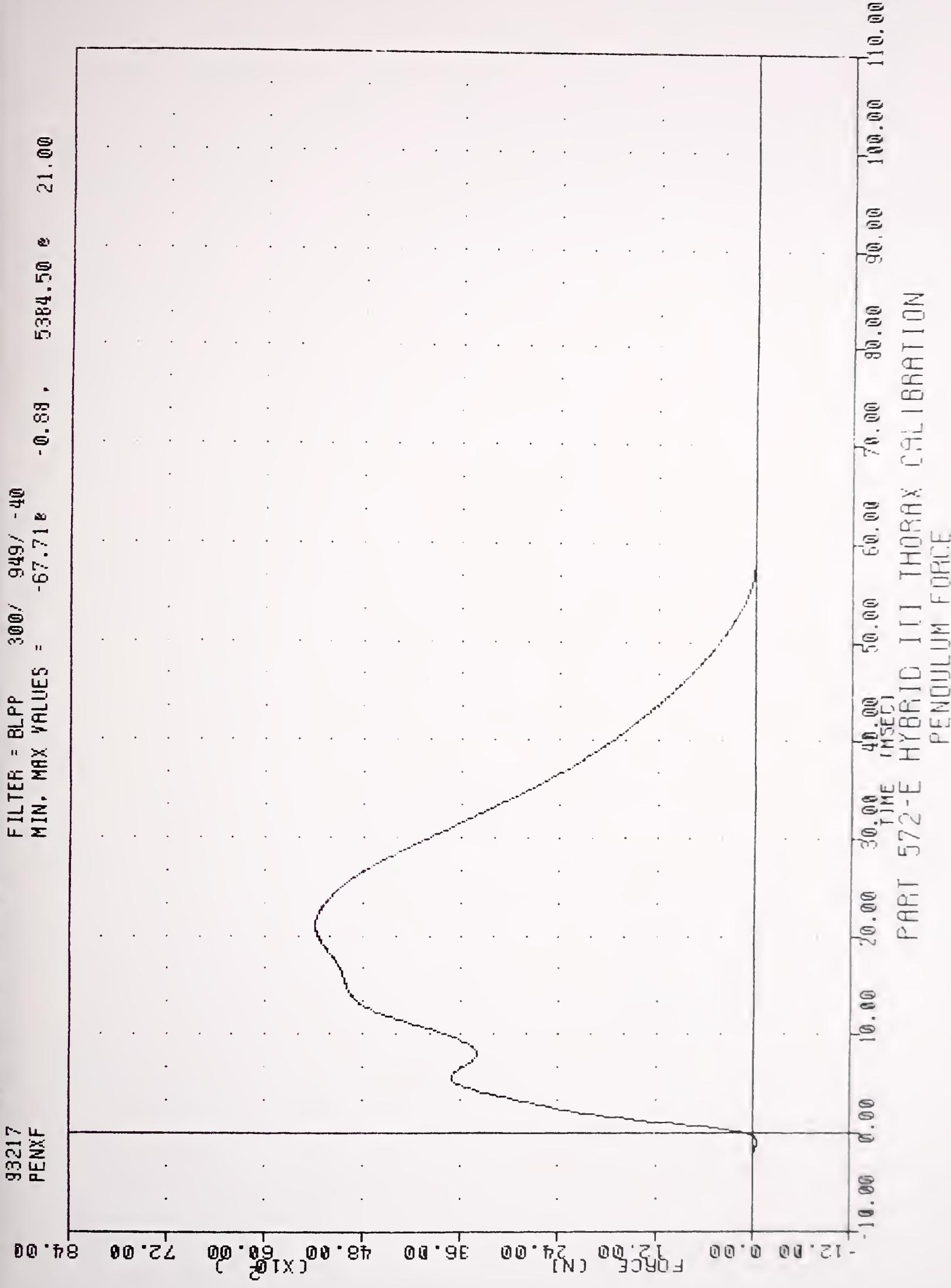
TRC
572E SN48 H. S. THORAX CAL09
93217
PENXG

FILTER = BLPP 300/ 949/-40
MIN. MAX VALUES = -0.300 -0.88 , 23.50 & 21.00



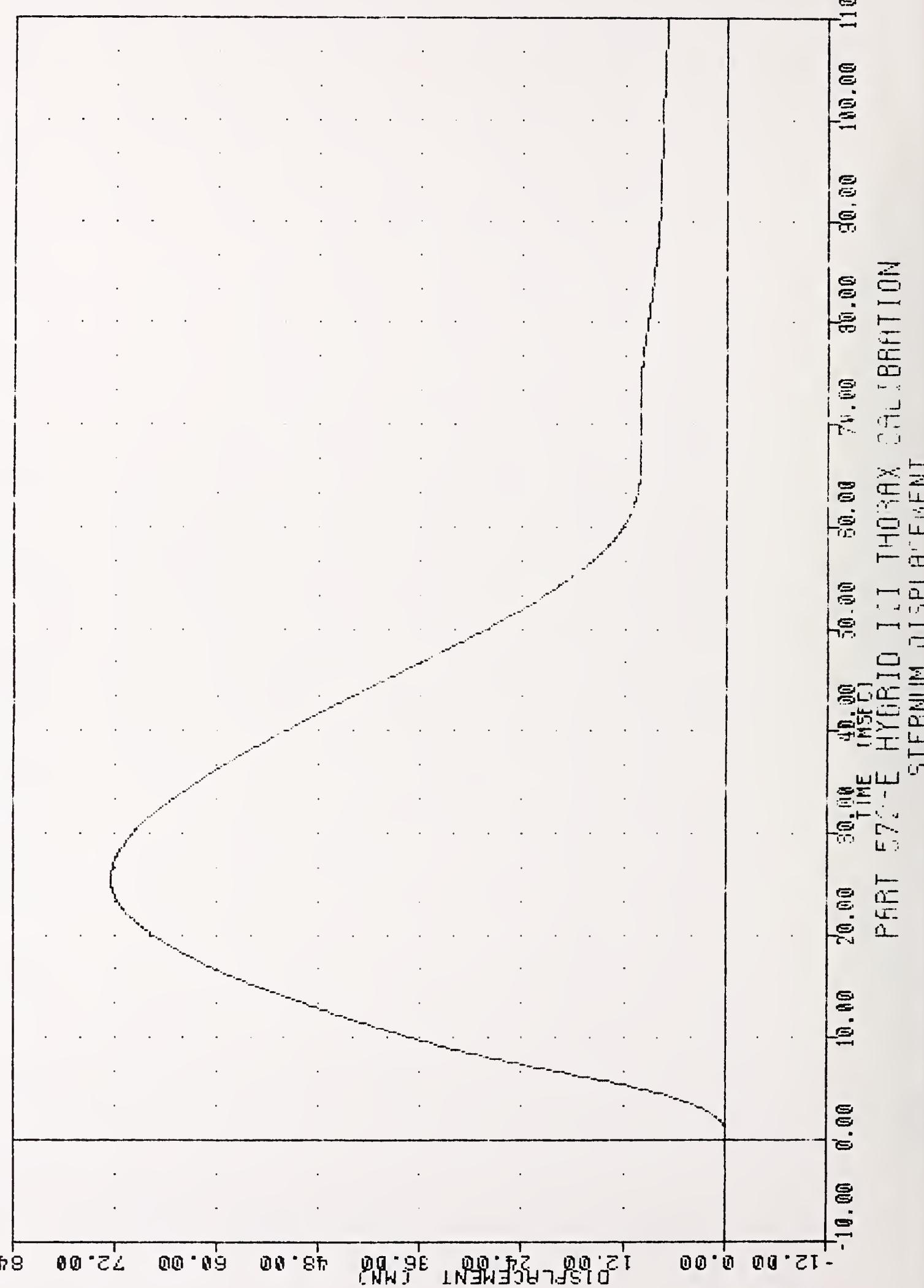
5.00 0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00
-10.00 0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00
PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

TRC
48C9THJ
572E SN48 H.S. THORAX CAL@9
93217
PENXF

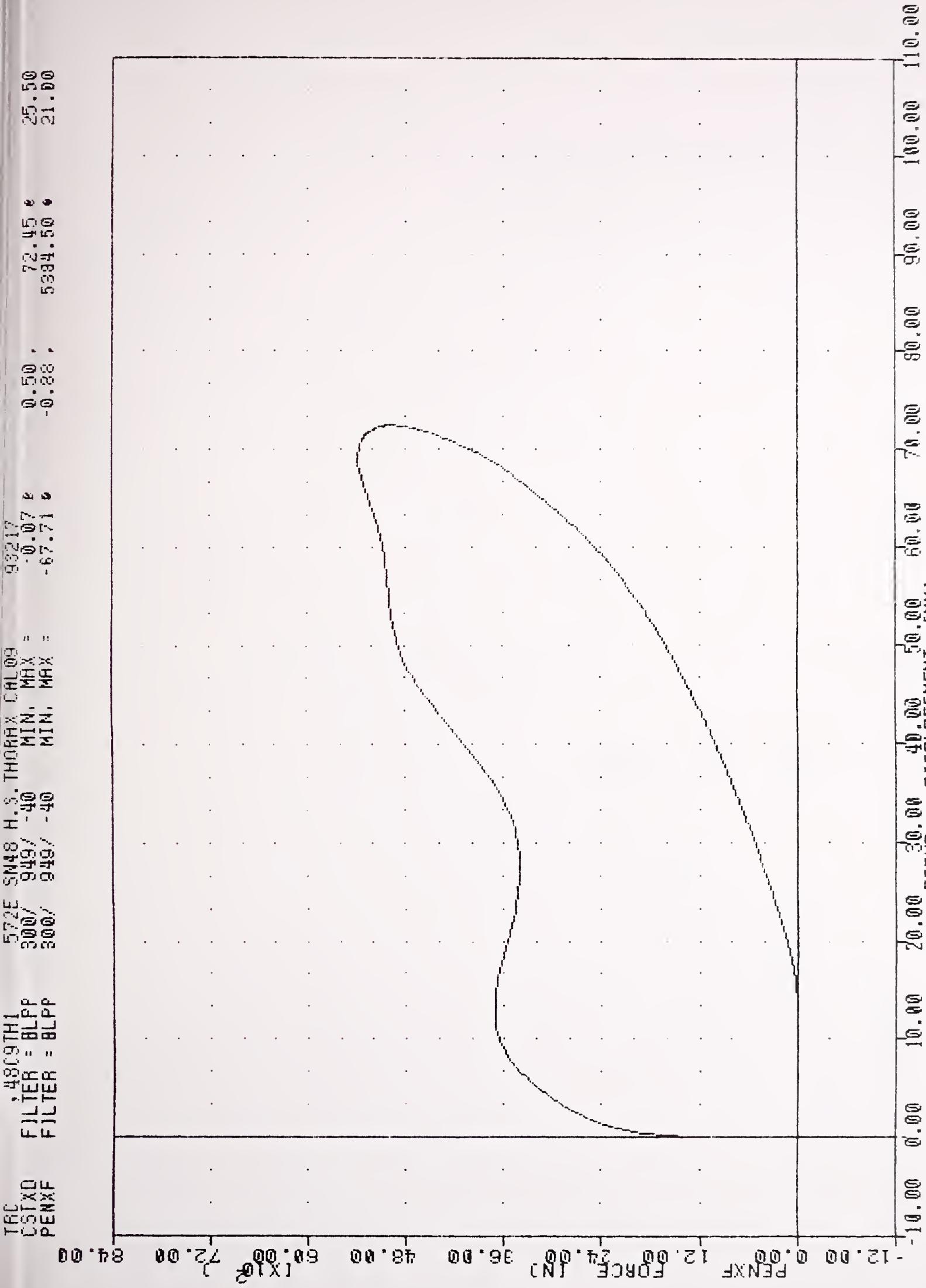


TRC
572E SW48 H.S. THORAX CAL03
93217 CSTX0

FILTER = ELP_p 300, 949, -10
MIN, MAX VALUES = -0.072, 0.50, 72.45, 8, 25.50



PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENETRUM FORCE



TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

HYBRID III

05-AUG-93

RIGHT KNEE

TRC 4BC9RK1

572E SN48 RIGHT KNEE CAL 09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
ITEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
IRELATIVE HUMIDITY	10% - 70%	50.0 %
IPROBE VELOCITY	2.07 - 2.13 M/SEC	2.10 M/SEC
IPeAK KNEE IMPACT FORCE	4714 - 5783 N	4816.4 N
IPROBE WEIGHT	5.0 KG	

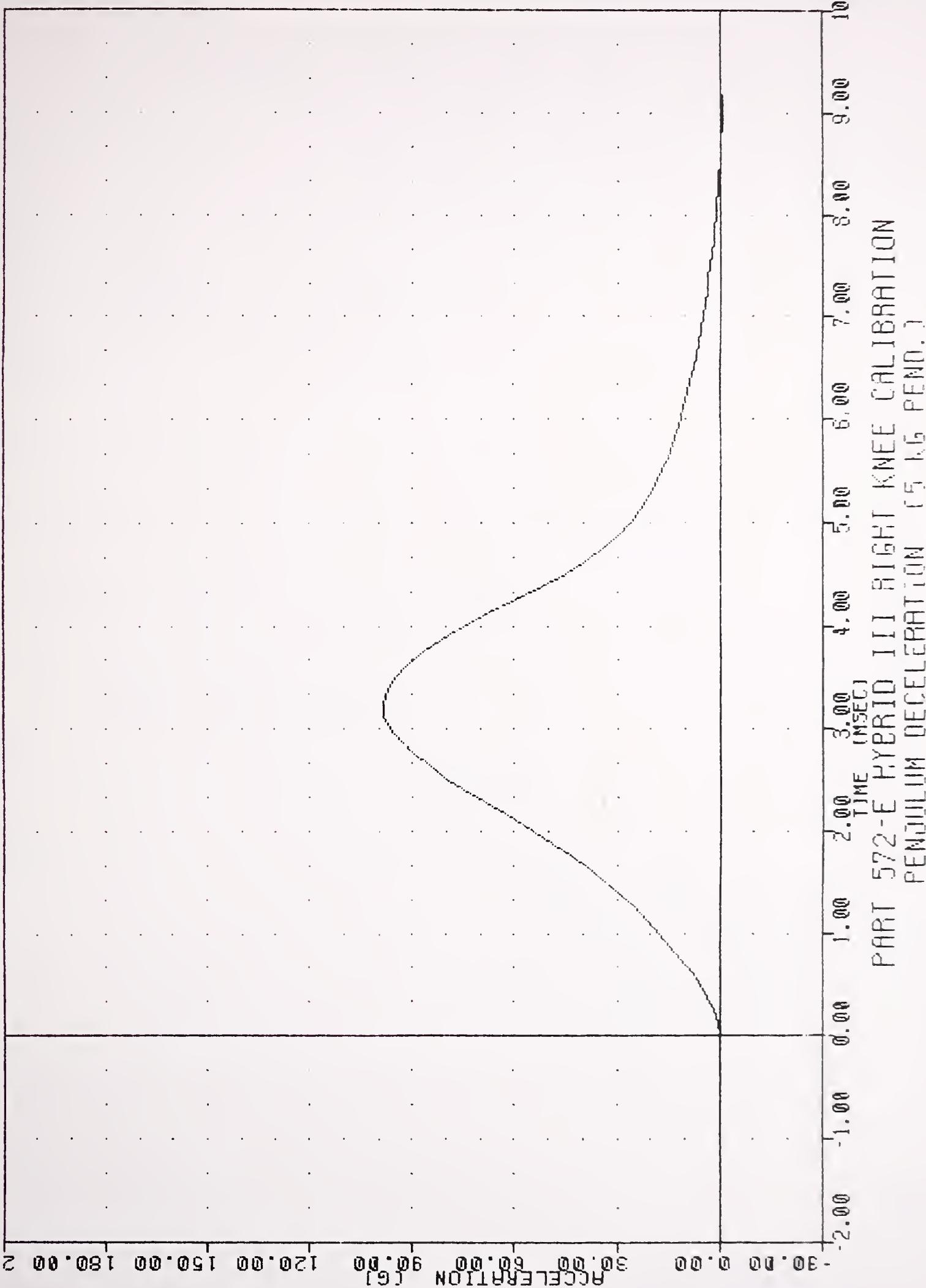
TEST MEETS SPECIFICATIONS

TECHNICIAN

Chris. Middlekauf

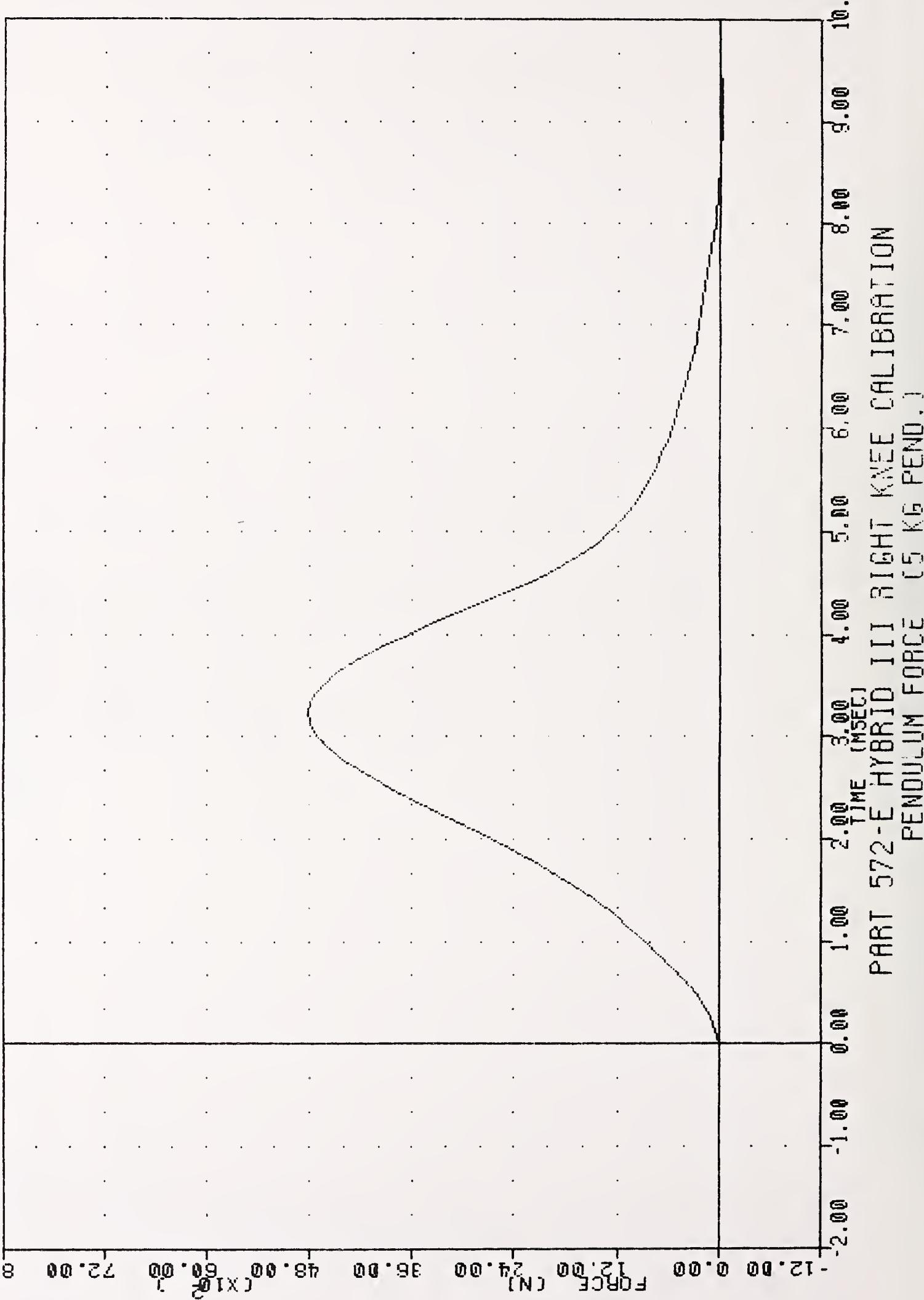
TRC
572E SN48 RIGHT KNEE CAL 09
93217
PENXG

FILTER = BLPP 1000/ 3162/-40
MIN, MAX VALUES = -0.588 9.000
93.44 8 3,25



IRL
572E SN48 RIGHT KNEE CAL 09
93217
PENXF

FILTER = BLFP 1000/ 3162/-40
MIN. MAX VALUES = -28.270 9.00
9.00 , 4916.48 & 3.25



TRANSPORTATION RESEARCH CENTER INC.

KNEE IMPACT TEST

HYBRID III

05-AUG-93

LEFT KNEE

TRC 48C9LK1

572E SN48 LEFT KNEE CAL 09

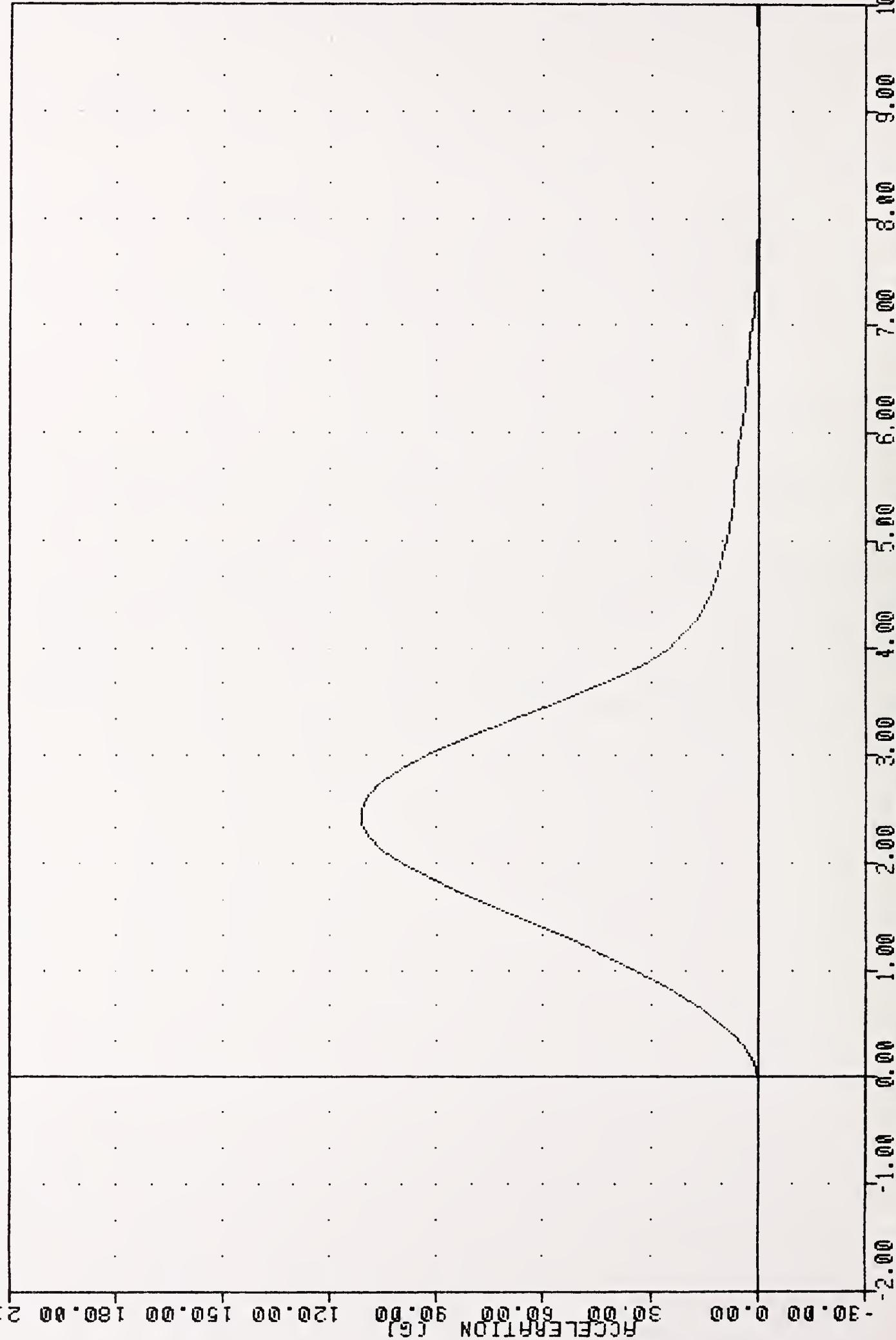
TEST PARAMETER	SPECIFICATION	TEST RESULTS
ITEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
IRELATIVE HUMIDITY	10% - 70%	50.0 %
I PROBE VELOCITY	2.07 - 2.13 M/SEC	2.10 M/SEC
IPeak knee impact force	4714 - 5783 N	5436.1 N
I Probe weight	5.0 KG	

TEST MEETS SPECIFICATIONS

TECHNICIAN Chas Middleton

TRC 4809LK1
572E SN48 LEFT KNEE CAL 03
93217
PENX6

FILTER = BLPP 1000/ 3162/-40
MIN. MAX VALUES = -0.478 8.38 , 111.11 & 2.50

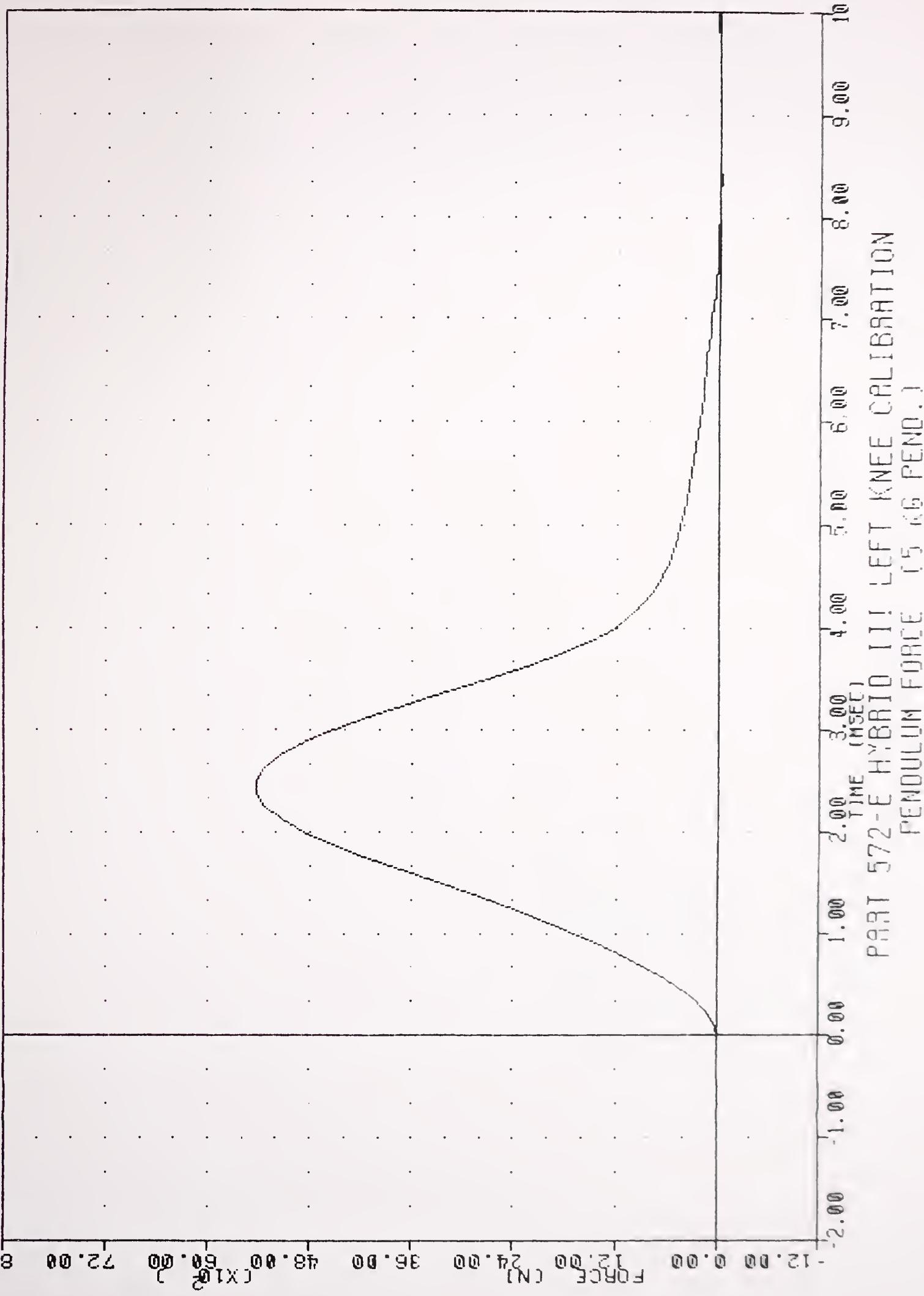


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC
572E SN48 LEFT KNEE CAL 09
93217
PENXF

FILTER = BLPF 1000/ 3162/-40
MIN, MAX VALUES = -22.82@ 8.3@ .

5436.15 @ 2.5@





APPENDIX D

MISCELLANEOUS TEST INFORMATION



DUMMY INSTRUMENTATION PLACEMENT

DUMMY MFR. & S/N: HUMANOID/048

SEATING POSITION: DRIVER

LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
HEAD ACCELERATION	X	ENDEVCO	7264	EH78J	REAR
HEAD ACCELERATION	Y	ENDEVCO	7264	DH37J	LEFT
HEAD ACCELERATION	Z	ENDEVCO	7264	DD17J	UP
NECK FORCE	X	DENTON	1716	0106	*
NECK FORCE	Y	DENTON	1716	0106	*
NECK FORCE	Z	DENTON	1716	0106	*
NECK MOMENT	X	DENTON	1716	0106	*
NECK MOMENT	Y	DENTON	1716	0106	*
NECK MOMENT	Z	DENTON	1716	0106	*
CHEST ACCELERATION	X	ENDEVCO	7264	EH92J	FRONT
CHEST ACCELERATION	Y	ENDEVCO	7264	CC24H	LEFT
CHEST ACCELERATION	Z	ENDEVCO	7264	FG28J	UP
CHEST DEFLECTION	X	VERNITECH	81422A	9041	OUTWARD
PELVIS ACCELERATION	X	ENDEVCO	7264	BC75J	REAR
PELVIS ACCELERATION	Y	ENDEVCO	7264	FC43J	LEFT
PELVIS ACCELERATION	Z	ENDEVCO	7264	AP87	UP
LEFT FEMUR FORCE		GSE	2435	726	TENSION
RIGHT FEMUR FORCE		GSE	2430	756	TENSION

*See SIGN CONVENTION sheet for positive sensing orientation of neck load channels.

VEHICLE INSTRUMENTATION INFORMATION

TEST NO. 930810

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
1	LEFT REAR SEAT					
	CROSSMEMBER LONGITUDINAL	X	ENDEVCO	2264	AR49	REAR
2	RIGHT REAR SEAT					
	CROSSMEMBER LONGITUDINAL	X	ENDEVCO	2264	GA24	REAR
3	ENGINE TOP LONGITUDINAL	X	ENDEVCO	2264	AB62	REAR
4	ENGINE BOTTOM LONGITUDINAL	X	ENDEVCO	2264	BK12	REAR
5	RIGHT BRAKE CALIPER					
	LONGITUDINAL	X	ENDEVCO	2264	AK87	REAR
6	LEFT BRAKE CALIPER					
	LONGITUDINAL	X	ENDEVCO	2264	AH88	REAR
7	INSTRUMENT PANEL CENTER					
	LONGITUDINAL	X	ENDEVCO	2264	AD97	REAR
	LAP BELT OUTBOARD FORCE		LEBOW	3419	674	TENSION
	SHOULDER BELT OUTBOARD FORCE		LEBOW	3419	673	TENSION
8	VEHICLE CENTER OF GRAVITY					
	LONGITUDINAL	X	ENDEVCO	2264	AK21	REAR
	LATERAL	Y	ENDEVCO	2264	AD97	RIGHT
	VERTICAL	Z	ENDEVCO	2264	AR38	UP

HEAVY TRUCK ACCELEROMETER INFORMATION

TEST NO. 930810

NO.	LOCATION	AXIS	MFR	MODEL	S/N	ORIENTATION (+ SENSING)
9	FRONT FRAME CROSSMEMBER	X	ENDEVCO	7264	CM07	REAR
		Y	ENDEVCO	7264	DR93J	RIGHT
		Z	ENDEVCO	7264	EA03H	UP
10	TRUCK CENTER OF GRAVITY	X	ENDEVCO	7264	CY26H	REAR
		Y	ENDEVCO	7264	CK16H	LEFT

SIGN CONVENTION

<u>ACCELEROMETERS:</u>	+X: FORWARD
	+Y: LEFTWARD
	+Z: UPWARD
 <u>POTENTIOMETERS:</u>	 +CHEST LONGITUDINAL DEFLECTION: OUTWARD
	+CHEST LATERAL DEFLECTION: LEFTWARD
	+SEAT BELT DISPLACEMENT: OUTWARD
	+SEAT BELT EXTENSION: ELONGATION
	+KNEE SLIDER DISPLACEMENT: DISTANCE BETWEEN FEMUR AND TIBIA INCREASED (IN RELATION TO A SEATED DUMMY)
 <u>LOAD CELLS:</u>	 +FEMUR FORCE: TENSION
	+SEAT BELT FORCE: TENSION
	+BARRIER FORCE: TENSION
 <u>NECK LOAD CELLS:</u>	 +X FORCE: HEAD PUSHED FORWARD
	+Y FORCE: HEAD PUSHED LEFTWARD
	+Z FORCE: HEAD PULLED UPWARD (TENSION ON NECK)
	+X MOMENT: RIGHT EAR ROTATING TOWARD RIGHT SHOULDER
	+Y MOMENT: CHIN ROTATING TOWARD CHEST
	+Z MOMENT: CHIN ROTATING TOWARD LEFT SHOULDER
 <u>TIBIA LOAD CELLS:</u>	 +X FORCE: TENSION
	+Y FORCE: TENSION
	+Z FORCE: TENSION
	+X MOMENT: BOTTOM OF TIBIA MOVING LEFTWARD
	+Y MOMENT: BOTTOM OF TIBIA MOVING REARWARD



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